

Technology Review

EDITED AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

OCTOBER 1990

\$3.00

BEYOND THE SHUTTLE

GETTING THE SPACE PLANE INTO ORBIT

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technology review

Published by MIT

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"Grown-ups tell us, 'Just say no.' That's easy for them to say."

"Maybe they forgot what it's like.

"At parties, at school, kids are saying to try this or do that, and they're my friends. I mean how many times can I hear I'm a loser.

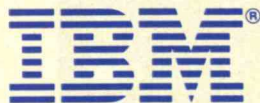
"Sure I'm scared of drugs. It's just there's so much pressure. You want to say no. But you can take a lot of heat for it."

Simple yes-no decisions aren't so simple when they involve kids and drugs.

That's why IBM has helped develop a computer-based, interactive video program that's now in schools. It simulates realistic social situations, and allows kids to make choices—about drugs, about alcohol, about themselves—and to experience the consequences, but without getting hurt.

The program is sponsored by the National Federation of State High School Associations, and preliminary results have been extremely encouraging.

To learn more about this program, write to us at IBM, P.O. Box 3974, Dept. 973, Peoria, IL 61614.



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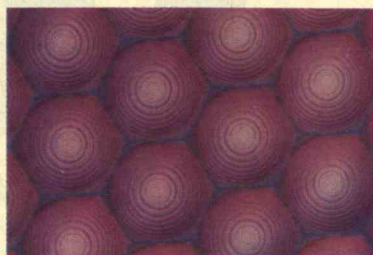
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Breakthrough in the effort to bore a tunnel under the English Channel may come as early as November. Billed as the largest civil-engineering project in Europe, the Chunnel is expected to open in late 1993.

COVER: Illustration by Ralph Mercer / Design by Kathleen Sayre

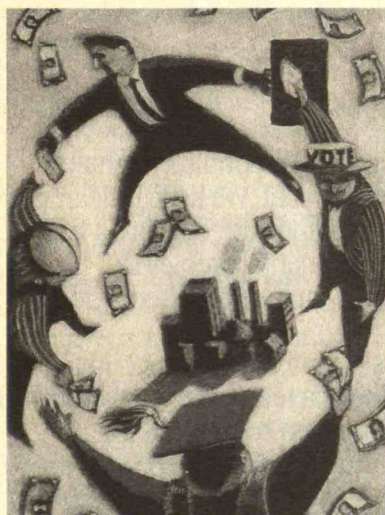
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Technology Review (ISSN 0040-1992), Reg. U.S. Patent Office, is published eight times each year (January, February/March, April, May/June, July, August/September, October, and November/December) by the Association of Alumni and Alumnae of the Massachusetts Institute of Technology. Entire contents ©1990. The editors seek diverse views, and authors' opinions do not represent official MIT policy. We welcome letters to the editor. Please address them to Letters Editor.

Editorial, circulation, and advertising offices: *Technology Review*, Building W59, MIT, Cambridge, MA 02139 (617) 253-8250. Printed by Lane Press, Burlington, VT. Second-class postage paid at Boston, MA and additional mailing offices. Postmaster: send address changes to *Technology Review*, MIT, Building W59, Cambridge, MA 02139.

Subscriptions: \$24 per year, libraries and organizations \$27. Canada add \$6, other foreign countries add \$12. Send inquiries to *Technology Review*, P.O. Box 489, Mount Morris, IL 61054. Or call 1-800-435-0715.

Advertising representatives: Mark E. Lynch, Eastern Sales Manager, West Ossipee, NH (603) 323-7087; The Leadership Network, 254 Fifth Ave., New York, NY 10001 (212) 684-5500; James G. Elliott Co., Los Angeles, CA (213) 746-8800; Donald Moeller, Dallas, TX 75226 (214) 559-5730; IMI Corp., Tokyo, Japan; Keith Olson/Media, Birmingham, MI (313) 642-2885; Joan Stapleton, Washington, DC (202) 331-7494.

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General Manager, Marketing
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Madeleine Marchese is General Manager, Marketing for Texaco Syngas Inc.

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FirstLine

Truth, Beauty, and Peer Review

READERS not infrequently write to upbraid me for some outrageous statement perpetrated by a publication that they had always considered authoritative. They may readily agree that newspapers, as H.L. Mencken once put it, never report anything accurately and fairly except perhaps professional baseball. But to ensure that *Technology Review* doesn't again deviate from the path of truth, these readers often propose peer review of our articles: submitting them for approval to panels of experts. We decline.

Peer review is widely seen as the modern touchstone of truth. Scientists are roundly drubbed if they bypass it and "go public" with their research. Science writers count on it as the test for what to report on. Artists hold it up as the rebuttal to Sen. Jesse Helms, who would distribute arts funding according to his own morality. Ming Cho Lee, a professor at the Yale School of Drama, huffed in a letter to the *New York Times*: "The only criterion artists or arts organizations must meet to be entitled to my money is that they pass the vigorous scrutiny and evaluation of a panel of their peers, based on a standard of artistic excellence."

Peer review is doubtless useful to help evaluate articles for journals focused on a particular discipline and as one mechanism, albeit fallible, to allocate grants. But our society often wants to see peer review as a mechanical certification of truth for which no one has to take responsibility. No such mechanism is conceivable.

The first limitation of peer review is that nobody can say quite what it is. Journal editors give manuscripts to a panel of scholars who remain anonymous. Some journals publish only articles that receive a majority of votes, but articles rejected by one peer-reviewed journal are often published by another: this touchstone is wobbly. Reporting on

an American Medical Association conference on peer review in June 1989, Lawrence K. Altman of the *New York Times* noted that journal editors may reject articles that the panel praises or accept articles it criticizes. No one knows how often this happens because journals do not report their policies.

Rep. John Dingell (D-Mich.), who chairs the House Oversight and Investigations Subcommittee, treated the nation to a detective drama on this theme, sending Secret Service agents to sleuth through the raw data for an article that had received the peer-review seal of ap-

*There is no
mechanical way to
certify truth.*

proval through publication in *Cell*. (Full disclosure: one of the article's principal authors, David Baltimore, now president of Rockefeller University, is a columnist for this magazine.) The specific case aside, Dingell's fundamental question is: can we unequivocally trust results of peer review?

Of course not. At a conference held last April by MIT's Science, Technology, and Society Program, Marcia Angell, executive editor of *The New England Journal of Medicine*, stated flatly that despite the scrutiny of peer panels and editors, "fraud can't be discovered if it is plausible." This problem is less dreadful than it might seem. In practice, scientists regard journal articles skeptically, as statements in an ongoing debate. Time and replication of experiments are the real mechanisms science relies on to weed out error.

A more pernicious danger is that peer review may reject important work, particularly for research funds. As Charles W. McCutchen, a physicist at the National Institutes of Health, has put it, peers on the panel reviewing a grant applicant "profit by his success in drawing money into their collective field, and by his failure to do revolutionary research

that would lower their own ranking in the profession. It is in their interest to approve expensive, pedestrian proposals." He cites the case of Donald Glaser's research on the bubble chamber, an apparatus to display nuclear reactions for which he ultimately won the Nobel Prize in physics. The National Science Foundation and other agencies considered it "too speculative" to fund, but fortunately the University of Michigan scrounged up \$750 to support his work.

In our offices in what is known around MIT as W59, a two-story brick building from which Heinz ketchup was once distributed, we hope to emulate the University of Michigan. We look for the important idea that has not yet received official certification, the thinker the media do not yet consider a valid source.

We don't eschew expert advice: we may well ask informal opinions on unusual articles from knowledgeable people, often at MIT. But there can be no peer review of articles that inextricably blend fact and opinion. We have even had informal readers refuse to comment on manuscripts on the grounds that they don't want to become "silent co-authors." So we scratch our heads, discuss manuscripts, and make the best decision we can.

Then begins the editing process, an intellectual exploration involving countless further decisions to help authors clarify their thinking as well as their writing. Even if the original had been peer reviewed, the final result would not be. Editing ends at 6:00 in the evening of the day the final page proofs go to the printer with titles, blurbs, and captions. That's a frightening moment.

If the article is truly foolish, I can expect a barrage of letters, and time will likely set the matter straight. If we made the opposite mistake, failing to publish important new thinking, I can rest assured that I will never be blamed, except perhaps by one author. But that is the worst mistake possible. ■

JONATHAN SCHLEFER

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Letters

ANOTHER LOOK AT BRITAIN

To many of your British readers, Robert F. Makalevy III's remarks about social unrest in the United Kingdom are as offensive as they are ill-informed ("Dis-sent in Britain," *Letters*, *TR* April 1990). He paints a picture of civil unrest, rampant violent crime, repression of the "working class," and state killing of innocent and gentle Irish Republican Army supporters. I do not expect to shake his deep-seated prejudice, but your readers should know that the real picture is quite different.

In fact, the number of offenses recorded fell last year and is continuing to decline. Industrial strikes are at their lowest level in 40 years. More people are now employed than ever before in our history, and—the important bottom line—the take-home pay of the average head of household is at record level.

Furthermore, the dismal polemic on British industry fails to point out that manufacturing output is at its highest ever. The average British manufacturing employee produces over 50 percent more now than 10 years ago. Britain is at the top of the European investment-growth table, and we have the strongest public finances of any major industrial country.

As for Ireland, we make no apology for enforcing the law and defeating terrorism at home or abroad. Those who maim and murder innocents in the name of Irish nationalism should find no sanctuary or sympathy in either of our countries.

ANTHONY NELSON
London, England

Anthony Nelson is a member of Britain's House of Commons.

THE TRUTH ABOUT OIL

I object to John F. Flynn's remarks about the U.S. Council for Energy Awareness ("Propaganda in Advertising," *Letters*, *TR* July 1990). The advertisements my organization has created provide truthful and factual information. Each ad is researched, and none can justifiably be

called "hysterical propaganda."

Moreover, the situation to which the ads refer is serious. Through June 15, 1990, America's net oil imports this year were 46 percent of total consumption, 35 percent higher than before the oil embargo of 1973. We cannot allow ourselves to remain at that level of energy dependence. It is dangerous for our nation's economy and security.

Finally, to refer to U.S. use of nuclear-generated electricity as "irresponsible" displays a poor understanding of the technology. Nuclear energy currently supplies almost 20 percent of the electricity we use in this country, which makes it our second largest source after coal. It does the job cleanly, safely, and efficiently.

EDWARD L. ADUSS
Washington, D.C.

Edward L. Aduss is vice-president for advertising at the U.S. Council for Energy Awareness.

EXPENSIVE LIVES

I was somewhat stunned by Renee Twombly's "Saving Young Lives" (*Trends*, *TR* April 1990), which uses my name in its first sentence. The author says that machines like my company's high-frequency ventilator, which helps premature infants breathe, "can be a burden as well as a blessing," and the article as a whole is discouraging, asking whether technology might simply be adding to the high cost of medicine or postponing infant deaths.

Twombly notes that 30 percent of infants weighing less than 1,500 grams at birth have special medical problems, including cerebral palsy, blindness, and mental retardation. That figure may be going down every year as improvements in care are perfected, or it may not be. More and smaller infants are being saved as we continue to push the limits of survivability. But even if the percentage remains constant, it's worthwhile to look at the other side of the coin, which is that 70 percent of infants with such a low birth weight are going home

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with no special problems. That means several thousand normal, healthy babies who would have died at birth only 15 years ago.

The expense of saving some of these children is staggering. I'm certain that few prospective parents expect their newborns to cost \$33,000 before they get them home. On the other hand, what about the burden families would have to bear if we were to choose to let babies die without a fight? Also, premature infants aren't the only ones whose lives are expensive to save. My trauma-physician friends tell me that victims of serious auto accidents encounter costs of \$60,000 to \$100,000.

Certainly prevention is superior to heroic treatment. We all wish there were no preemies, just as we all wish there were no auto accidents. And it would be nice if doctors had foolproof ways of knowing ahead of time how severe the complications of treating these patients would be, so a system for assessing the quality of life might be established. But we're a long way from being able to perform such feats.

For those of us in the field of developing better ways of caring for babies that are born too soon, the trends are not discouraging. Not every infant we help save is a miracle, but miracles far outnumber tragedies in this business. And while they are expensive, most of us consider them a bargain.

J. BERT BUNNELL
Salt Lake City, Utah

DEVELOPMENT IN INDIA

"Development Without Growth: The Kerala Experiment" by Richard Franke and Barbara Chasin (*TR April 1990*) is excellent, but the authors ignore some areas in their list of suggestions for future initiatives.

First of all, garbage and storm water in low-lying urban areas of the Indian state not only pose a threat to road transportation but could also create an environmental hazard. While it is clear that any socialist government, including Kerala's, will tend to emphasize redistri-



bution, this approach is questionable when an infrastructure is in such a state of disrepair.

Moreover, a significant portion of the state's net income originates from expatriate labor, and the remittances these workers have received may have played a role in inflating wage expectations in Kerala. Such income may have also laid the basis for many development-oriented programs. A question arises: Is further development possible now that layoffs in the Persian Gulf states are causing the remittances to dry up?

Another problem is that the influx of money has helped create social tensions. That is, Keralites who missed the "Gulf Airbus" sometimes seem to be telling their more fortunate fellow citizens, "Your money is welcome but you are not." Increasing crime in urban areas is often the result.

Keralites have a built-in classification scheme that favors decentralized, small-scale efforts. Centralized, large-scale efforts, by contrast, receive little support—even though they could provide important benefits such as subsidized education and welfare disbursements. A more balanced approach

should be stressed.

NAGENDRA SUBBAKRISHNA
Philadelphia, Pa.

The information that Richard Franke and Barbara Chasin supply about development without growth in Kerala, India, may not apply to many other places, but it does mark a unique approach to the problems of poverty.

The thing that puzzled me was the lack of reference to Christianity. The area happens to be the oldest and most Christian part of the subcontinent; tradition holds that St. Thomas established the church there in the first century. Certainly the state saw later enhancements of Christianity, along with Judaism, in the mission era that followed the age of explorers and commercial interests.

My sources indicate that the mission effort created the high literacy rate, and that this improvement in turn helped the communists spread their doctrines. Today Islam, Christianity, and Hinduism all thrive in Kerala, and the Syrian Orthodox Church of South India, the Mar Thoma Church (largely under Protestant influence), and the Eastern Rite Roman Catholic Church continue to provide education, often subsidized by the state of Kerala.

CLIFFORD H. FIELD
Shelton, Conn.

The authors respond:

In answer to Nagendra Subbakraishna, environmental hazards indeed plague Kerala. The state's radical political tradition has produced India's broadest ecology organization, led by the People's Science Movement, which attempts to respond to such problems.

Middle East remittances deserve detailed study, but they are not directly relevant to the redistribution issue, since they are not specially taxed. We are unaware of any research linking urban crime with them or attitudes toward them.

Mr. Field is correct in saying that Christianity played an important part in *Continued on page 75*

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In 1917 Boeing built its first airplane, 20

If you are an engineer or scientist, we'd like you to consider Boeing as a place to pursue your career. That's what this advertisement is all about. It's based on the belief that a good way to learn about a company is to meet the people who work there. To that end, we'd like to introduce Dr. John McMasters, a research aerodynamicist and one of some 20,000 engineers at Boeing. In his workaday world, he helps design Boeing jetliners. In his spare time, he's a self-proclaimed paleoaerodynamicist.



Ask Dr. John McMasters to define the proper field of study for an airplane designer and he'll say, "Everything that flies. All the time, professionally and avocationally."

That includes jetliners, certainly. And also insects, seeds, birds, bats, a certain reptile that executes aerial maneuvers of surprising grace and precision, hang gliders and boomerangs. Plus things that once flew, but don't now, such as pterosaurs.

Especially pterosaurs, in fact. They dominated flight for 120 million years and, reptiles or jets, all flying things encounter the same basic problems.

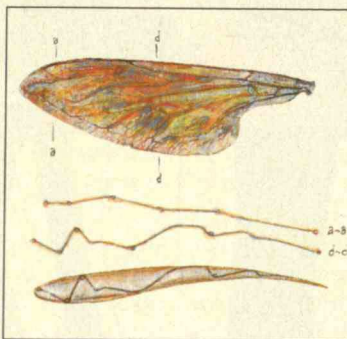
Sit back and ask McMasters to elaborate. It's a fascinating story.

You'll learn that 20 years ago, as a graduate student, he embarked on what he now describes as a ridiculously complex enterprise: the study of general locomotion.

"It was not the least bit modest," he says. "I envisioned a grand theory of optimal locomotion embracing the entire range of natural and man-made devices traveling through the air, on land, and in or on water."

His unified theory remains elusive, but the search has been hugely rewarding.

McMasters' investigations have included jumbo jets, bat wing architecture, the wing geometry of soaring birds, the



The irregular surface and tubular structure of insect wings are an elegant solution to a very difficult flight problem.

million years after reptiles learned to fly.

complexities of flapping flight, and similarities between hang gliders and flying reptiles.

Along the way, he helped found the Flight Research Institute (FRI). Members, including many Boeing people, agree that all flying things, and some that don't fly, deserve inquiry.



The pinion feathers at the wing tips of large land-soaring birds are a natural model for winglets on the newest Boeing 747 jetliner.

The Institute provides ways to explore these avocational interests with many of the same tools available at Boeing. Projects supported by the Institute include racing sailboat hull design; a flying model of a pterosaur; a streamlined bobsled for Olympic competition; a small fleet of human-powered flying machines; a subsonic wind tunnel; a more efficient arrow for Olympic archers; kite-powered water-skiing.

All very intriguing, you say, but so what? What difference does it make?

There are at least two answers.

McMasters points out that Boeing needs the best scientific and engineering

talent available in aviation, aerospace, electronics and computer services. The company looks for people with ideas and a lively curiosity about the world and its possibilities.

Boeing supports inventive minds in many ways, contributing to higher education, helping employees pursue advanced degrees, creating courses and institutes if necessary, including one of the world's most advanced computational fluid dynamics laboratories—one of the tools used by Boeing aerodynamicists.

McMasters' second answer is more personal: "What began as a naive but serious enterprise has become a sort of merry drunkard's walk through a range of fascinating topics.

"My inquiries continue, despite suggestions from some doubters that there's little commercial value in designing better butterflies, and thus

no merit at all in understanding how they work. I believe understanding the principles of flight helps make one a better designer of devices that do

have commercial value.

"Equally important, I believe it's periodically valuable to stand back from the details of a career to see a whole picture—to see one's work in full perspective.

"The effort can be immensely refreshing. And humbling."



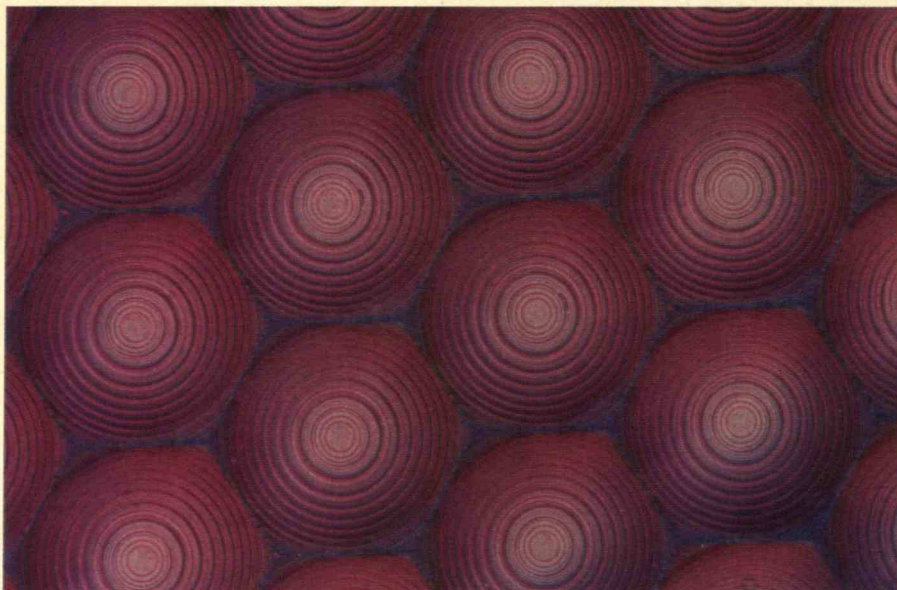
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Dr. McMasters is a research aerodynamicist at Boeing Commercial Airplanes Division. He has taught at Purdue University and Arizona State University and has written 65 technical papers, reports and articles. He is preparing a book on the Biological Origins of the Aeroplane. McMasters is a graduate of the University of Colorado and Purdue.

BOEING

MIT Reporter



A NEW WAY OF SEEING

 The development of a lens with a cross-section of tiny notches rather than a smooth curve is yielding lens and sensor systems that are lighter, more efficient, easier to produce, and potentially less expensive. The technology, called binary optics, could find a use in everything from implantable eye lenses to components for compact-disc players, laser printers, and high-definition TV.

"I really believe this technology is going to explode," says Wilfrid Veldkamp, leader of the binary-optics program at MIT's Lincoln Laboratory, where research on the subject has taken place over the last 15 years or so. He says that the recent ability to create much finer lenses—as small as the size of a cross-section of human hair—has led to the development of lens arrays that can be used in signal processing. But other uses could come to the fore as well. At least one company that has worked with Lincoln Lab on a proprietary basis has already tested binary-optics lenses for use with cataract patients.

Unlike most lenses, binary-optic devices do not work by bending light waves in accord with variations in a


MIT's Lincoln Laboratory has tested an array of binary-optic lenses to focus light in an imaging system.

material's thickness. Instead, they take advantage of diffraction, in which light waves bend and focus after hitting the edges of an etched pattern.

Binary-optic lenses could potentially cost less than traditional lenses because they do not have to be tediously ground to perfection. In fact, they can be mass-produced using methods similar to those for making microelectronic chips.

And not only can binary-optics devices replace traditional lenses but they work better and have more applications, according to Veldkamp. For example, optical sensors might process incoming signals much more rapidly if a mechanical "smart eyeball" consisting of stacks of microscopically thin layers of circuits and binary-optics devices is used. Television cameras and robotic vision and infrared recognition systems are some of the products that could use these sensors. The lenses can also be arrayed in ways that produce more precise, powerful laser beams.—**DAVID LAMPE** is editor of the MIT Report. ■

HOW LONG SHOULD ENGINEERING SCHOOL LAST?

 The world usually treats engineers much as consumers regard sacks of potatoes—as commodities, says Michael L. Dertouzos, director of MIT's Lab for Computer Science. Corporations and governments tend to think of engineering help simply as technological assistance they can buy when the need strikes. Concerned that engineers are too seldom seen as leaders who can consider technology in its social and political context, Dertouzos has long wanted to broaden their education at MIT. Other professors, meanwhile, have wanted students to gain more technical knowhow.

Partly in response to MIT faculty who share these perspectives, last year the Institute's School of Engineering concluded that the undergraduate degree should be thought of as pre-professional. Because each MIT department decides on curriculum changes individually, the school asked the departments to review their programs in the context of making the first professional degree the master's. Underlying the notion is the concept of transferring the criteria for undergraduate engineering accreditation from the bachelor's level to the master's. The average time needed to obtain a master's degree, which some faculty believe is too long, would be shortened.

Now two departments—Electrical Engineering and Computer Science (EECS) and Ocean Engineering—are considering changes that reflect these concerns. Given MIT's national visibility in engineering education, the action could spark a "revolution" that would lead to broader engineering programs elsewhere, says Edward W. Ernst, president of the Accreditation Board for Engineering and Technology (ABET). But while the idea of expanding engineering education is growing, there's controversy over whether making professional credentials dependent on another year of school is the way to go.

Nationally, many who favor expanding engineering education speak of the value of taking courses in different languages and on foreign cultures. The trend in engineering is toward working in an international context, they say. Proponents also remark that students need to take other liberal arts courses to expand their knowledge beyond the engineering profession. And because of the continuing advances in technology, many educators are keen on delving deeper into basic engineering principles.

Such concerns are not new. Indeed, 120 years ago belief in a broad education for engineers led Dartmouth College to offer a five-year program leading to a bachelor's degree—a tradition that continues. But most schools that have tried this in the more recent past have eventually switched back, concluding that four-year programs elsewhere were siphoning off too many students. A frequent exception to the rule are undergraduate programs in architectural engineering, which at many schools require five years of study for a baccalaureate.

The engineering school at the University of Louisville might be the only one in the country that has recently offered roughly the kind of program MIT's EECS and Ocean Engineering departments are considering. And even there the pressure to revert to a more conventional approach has been significant. Starting this year, freshmen can sign up for a four-year program that in the future may be accredited.

Other universities have come up with different schemes to achieve a broad engineering education. For instance, one of the four-year undergraduate programs offered by the University of Pennsylvania's School of Engineering and Applied Science focuses largely on liberal arts. And at Stanford University's School of Engineering, the undergraduate programs "walk the line between liberal arts and engineering," says David Freyberg, associate dean for student affairs.

Some deans oppose changing the traditional four-year engineering educa-

tion concept. There's a "trade-off—the four-year graduate is in great demand," says Don Rathbone, dean of the College of Engineering at Kansas State University. "Is the enhancement that great to individuals when they have to put in the extra year? Also, engineers are good at continuing education."

Recognizing that the issues of whether and how to broaden engineering education are important, the education division of the National Society of Professional Engineers recently started monitoring interest around the country in five-year "first professional degree" programs. Meanwhile, ABET has proposed changing accreditation criteria for master's programs.

How Will MIT Faculty React?

At MIT, the Department of Ocean Engineering has asked ABET to stop accrediting its undergraduate program in naval architecture and marine engineering, from which only a handful of students graduate annually. Instead, the department wants to set up master's-level accreditation for a five-year program combining bachelor's and master's courses.

Many more undergraduate students could be affected by changes that the EECS Committee on the First Professional Degree is discussing. About 300 students in the Department of Electrical Engineering and Computer Science annually receive baccalaureates. According to the broad-based first proposal by the group, both the content and teaching style used in core subjects would change. For example, introductory courses would give more stress to environmental concerns and economics. This would not only help aspiring engineers but also students who leave with four-year degrees to pursue fields like law and business, says William M. Siebert, a main committee member and EECS professor.

For students who want a professional career in engineering, the proposal calls for a thesis that is less time-consuming than is often now the case.

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MIT engineering dean Gerald L. Wilson favors awarding undergraduate engineering accreditation after students have completed five years of school.

Students interested in doctoral work might conduct more research prior to embarking on their doctoral dissertation.

By this past summer, the committee's concepts had prompted interest but also concern. Faculty members wanted more details on whether the changes would hurt research-oriented master's degrees, according to Paul L. Penfield, Jr., EECS department head.

Gerald L. Wilson, dean of the engineering school and a foremost advocate of the overall concept, wanted to ensure that the ration-

ale for the shortened thesis was well thought out and understood by all EECS faculty.

And Hermann A. Haus, EECS Institute Professor, worried about some of the ideas outlined for raising money for fifth-year students. Committee members and other faculty will be discussing the financial issue in more detail in the fall. Support could come from industry, a rearrangement of research assistantships, and possibly students themselves—typically in the form of loans, says Campbell L. Searle, committee chair and EECS professor.

If, in the end, the EECS faculty decides by consensus to go ahead with the proposed changes, the earliest students could receive master's degrees under the program would be 1996. As for Ocean Engineering, it will probably start offering a broader mix of courses for its undergraduate students in September 1991, says T. Francis Ogilvie, department head.

In the meantime, interest in five-year programs within some other engineering departments at MIT could build, according to Wilson. "I'm absolutely convinced," he says, "we have to broaden the skills of engineers and their attitudes about where technology interacts with society."—LAURA VAN DAM *edits MIT Reporter*. ■

some Western European nations, will be frustrating and ultimately unsuccessful, Skolnikoff predicts. "Not only do we need to know a lot more, we need to plan much more, so that if the problem turns out to be real and damaging ... we then can move quickly."

Skolnikoff calls for greater spending on research, more examination of policy alternatives, and a new "process for

rapid response." He cites the historical precedent of the International Monetary Fund, which set up a fund and an organizational mechanism for short-term loans years before currencies became convertible and such resources could be put to use.

Skolnikoff's article has sparked opposition in the scientific community. "He's more impressed with the scientific uncer-



Eugene Skolnikoff, MIT political science professor, calls for greater spending on greenhouse-effect studies.

tainties than many people who are working on the science," says Gordon McDonald, a geophysicist and chief scientist at Mitre Corp. "His discussion of the economics is, I think, badly flawed in the sense that he considers only the costs that are involved in bringing CO₂ down," McDonald points out that after the 1970s' oil shocks, conservation measures reduced CO₂ emissions without slowing the economy.

Skolnikoff says he wrote the article to inject a note of pragmatism into a frequently unrealistic policy debate. Global warming is a peculiarly difficult issue for international policymakers to grapple with, since it affects a wide range of interests. And both the ecosystem and the socioeconomic system are characterized by an inertia that's difficult to overcome. Also, universal commitment is required for effective action. All this contributes to what he calls policy "gridlock."—WADE ROUSH, an MIT graduate student, interned at Technology Review last summer. ■

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GLOBAL-WARMING POLITICS

 Costly efforts to reduce carbon dioxide emissions and improve energy efficiency might slow a runaway greenhouse effect. But they must be justified on other merits as long as genuine uncertainties about global climate change persist. So writes Eugene Skolnikoff, professor of political science at MIT's Center for International Studies, in *Foreign Policy* magazine. For example, cutting off the production of chlorofluorocarbons (CFCs), which contribute to global warming, is worthwhile since that would also slow the degradation of the ozone layer.

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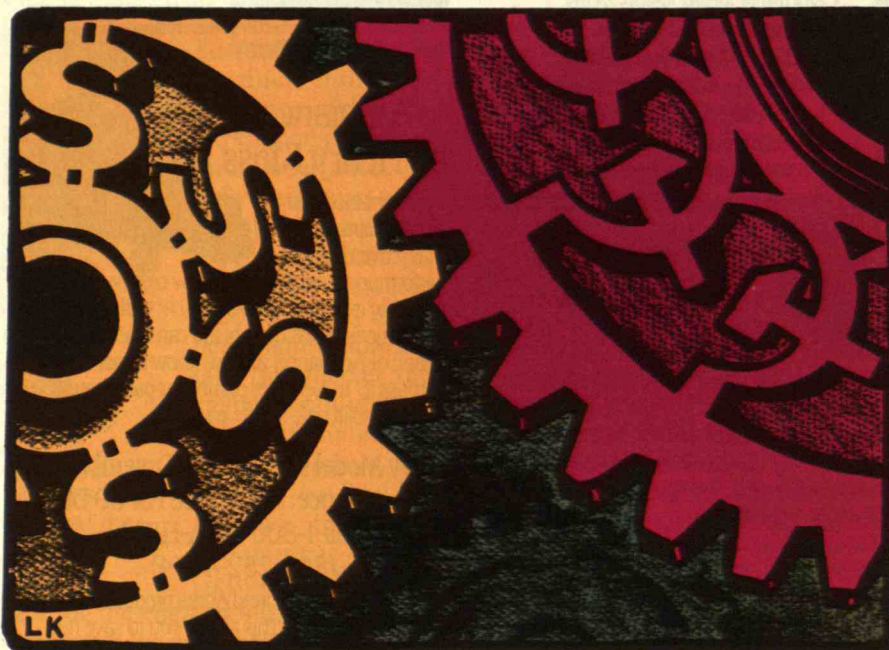
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Trends



Soviet Science for Sale

In return for hard currency and high technology, the Soviet Union is offering the rights to developments in fields as diverse as materials, biotechnology, and high-energy lasers. While the Soviets have long exported technology, primarily to Europe, the pace and breadth of the trade are accelerating dramatically.

"It has been inspired by the change under *perestroika*," explains Peter Walsh, vice-president of Project Development International Inc., a New York firm that has been involved in Soviet technology transfer for over a decade. The markets for potential products are largely outside the Soviet Union, and Soviet reforms require institutes and enterprises to be more self-sufficient—with their own profit and loss responsibilities. Moreover, if Soviet scientists hope to buy foreign equipment, they must obtain hard currency. "That means selling products or technology to the West," Walsh notes.

In the last two years, Soviet research institutes—encouraged by their government—have begun to peddle a broad array of technologies, including some that were once militarily sensitive. For example, much of the technology developed for the Soviet shuttle is up for sale. That, says Walsh, has attracted the attention of a Japanese corporation.

While Walsh cautions that the Soviets are pushing a few outdated technologies, corporations have begun licensing many Soviet ideas, processes, and products that had been unavailable in the West. His firm recently launched a joint venture with Barcon International of Ohio to secure rights to market a variety of Soviet metallurgical technologies, including a cheaper way to remove the scales from the surface of sheet metal. Several U.S. and European pharmaceutical concerns are exploring Soviet drugs and medical instruments. And in May, Monsanto, drawn to a process for applying diamond films to polymers, formed a research collaboration with four Soviet laboratories. The firm secured licensing rights to the technol-

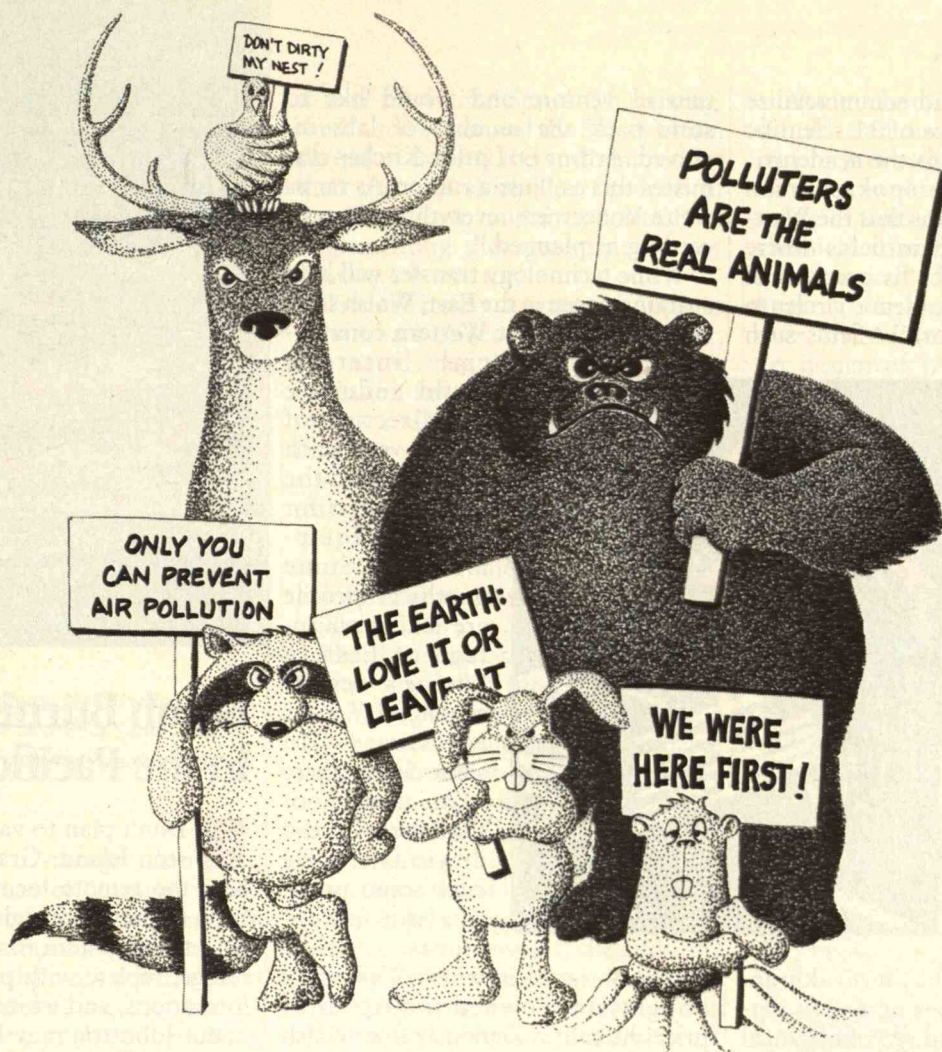
ogy in return for an undisclosed amount of financing and equipment.

Western observers have discovered that Soviet scientists—bereft of sophisticated analytical testing equipment, computers, and manufacturing processes—have sometimes developed less expensive or more efficient alternatives. For instance, Genesis Technology Group of Cambridge, Mass., which commercializes Eastern European biotech, is looking at a novel fermentation process developed by Armenian researchers. The process, which could be adapted for the food and beverage and pharmaceutical industries, culls unwanted bacteria with a simple virus that kills selectively. "It is more advanced than anything here," says Genesis managing director Christopher Messina.

Some agreements resemble technology-transfer deals struck between small U.S. companies and larger Japanese or European firms. For example, the Soviet Association of Biotechnology hopes to secure funding to develop drugs and agricultural products by forging Western-style alliances between Soviet labs and large multinationals. In the spring, the association signed an agreement with Genesis Technology to help Soviet officials select medical or biological research projects "that are potentially of interest to Western partners," explains Messina. Genesis will market the projects to large pharmaceutical companies or mid-sized biotech firms. Soviet scientists will retain the patents and receive royalties but will sell commercial rights in return for R&D funds and technology.

Brains for Rent

Arthur D. Little Inc., a Cambridge, Mass., consulting firm, may have made one of the largest technology-transfer deals thus far. In February, the Soviet Academy of Sciences and Arthur D. Little agreed to form a joint enterprise called E'West Managers SA. The resulting Swiss-based com-



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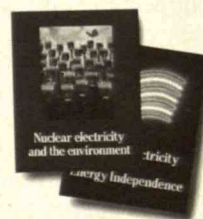
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pany will develop and commercialize technology in the labs of 31 scientific institutes connected to the academy.

Arthur D. Little spokesperson David Kitchen explains that the Westerners are interested in fields where Soviet basic research "is pretty well known in Western academic circles to be doing leading work"—fields such as surface chemistry, ceramics, extruder technology, high-energy lasers, and plasma physics. The projected \$50 million funding for the venture will come from a syndicate of Japanese, U.S., and European multinationals.

Besides licensing technology, some Soviet scientists hope to offer their research skills—what Walsh calls "contract brain power at very low cost." The Shemyakin Institute in Moscow has agreed to perform agricultural and pharmaceutical research for Monsanto in return for \$1.5 million in research funds over three years. Monsanto will have first right to commercialize any products that may result. Monsanto director of international development Michael Pertrilli describes the deal as "just like agreements we have with other research universities such as Oxford or the University of Washington."

Walsh believes the Soviets will jump for such contracts in the next few years. "It is almost a kind of bartering," he points out, and it's much simpler to negotiate than agreements like Arthur D. Little's complex arrangement with the academy.

In fact, E'West has hit a snag. There are signs that the Soviets have grown apprehensive about committing the fruits of so many facilities to a single

untried venture and would like to scale back the number of labs involved. Arthur D. Little's Kitchen dismisses this as "just a rumor. As far as we're concerned, everything is proceeding as planned."

While technology transfer will help sustain science in the East, Walsh says, there is worry that Western commercial

interests could influence the direction of Soviet research and exploit the Soviets' quest for cash and equipment. "Some unethical people are taking advantage of Eastern Europe's desperate need," says Messina. "In some circles, there is an element of short-term greed driving it." He cites some privatization agreements that

Hungary signed in which Westerners bought state-owned industries at prices he calls ridiculously low. Walsh agrees: "There is a lack of experience in dealing with Western contacts."

Still, Kitchen argues, the Soviets stand to gain substantially. Even if in the short term they part with the fruits of years of lab research, "in the long run they will also gain experience with commercial processes—experience they need to go forward on their own as an economic force."

Messina adds that technology transfer—in both directions—"can only bode well for both sides." Collaboration could narrow the gap in understanding between scientists in the East and the West, and the cross-fertilization of ideas may eventually lead to new technologies. ■

TOM KIELY is a Technology Review contributing writer.



Bomb Burning in the Pacific

■ Don't plan to vacation on Johnston Island. Granted, you can't beat the remote location, 800 miles from the nearest neighbors in Hawaii. And the 600-acre island is a wildlife refuge, replete with palm trees, coral formations, and white sandy beaches.

But Johnston may be as uninviting as an island can get. It is here that the United States is starting to incinerate the first of its huge, lethal, and aging arsenal of chemical weapons. Because of the technical and political questions the issue generates, the superpowers will be watching JACADS—the Johnston Atoll Chemical Agent Disposal System—as an important model. In both the United States and the Soviet Union, chemical demilitarization is in its infancy, and officials of both nations have acknowledged repeatedly that destroying such stockpiles is a nasty and dangerous business.

The modern world has long punished Johnston for its remote location. In the 1950s, the U.S. Air Force exploded two hydrogen bombs over Johnston atoll, of which Johnston is the largest island. In 1971, Johnston



The superpowers hope the Johnston Island facility will prove that their huge and lethal arsenal of chemical weapons can be disposed of safely.

Island became a storage facility for thousands of tons of chemical weapons left over from the Pacific front in World War II. Burning these agents should keep the island's new chemical weapons incinerator running almost steadily for over a year. But beginning this fall, more chemical weapons are scheduled to arrive from Germany.

Many observers around the world cheered when in 1987, President Reagan and German chancellor Helmut Kohl agreed that the United States would take its chemical weapons out of Germany. The current arrangement stipulates removing the weapons by the end of this year, and for now the Johnston facility is virtually the only place on the globe able to destroy them. Thus, under intensive guard, 100,000 artillery shells loaded with chemical agents are moving by truck, rail, and ship halfway around the world to the island.

That's just the start. The weapons in Germany comprise barely 1 percent of U.S. chemical agents, and the total Soviet stockpile is even larger than

that of the United States. This spring, the United States and the Soviet Union agreed to destroy the vast majority of their chemical stockpiles. But fears of a mishap have raised opposition to implementing the agreement on any country's home turf.

Trevor Findlay, a research fellow at Australia's Peace Research Center, has noted that the chemical demilitarization issue has split environmentalists and arms-control advocates into three camps distinguished by the risk they fear most: the use of chemical weapons, their transportation, or the disposal process. "When disarmament meets the environment . . . painful choices are involved," Findlay holds.

On the Soviet side, Mikhail Gorbachev has called for U.S. collaboration in his country's efforts to destroy its chemical weapons, and indeed, such collaboration is written into the agreement. Brookings Institution senior fellow Elisa Harris, an expert on chemical and biological weapons, notes that "the Soviets are clearly capable of destroying their own chemical weapons." However, she adds, the Soviet people have little confidence in their government's ability to do the job. Harris dubs the domestic Soviet problem part of a "post-Chernobyl syndrome."

The extent of superpower collaboration remains to be seen, but U.S. experts from the Army's chemical incineration program have already met in Geneva and Moscow with their Soviet counterparts to discuss the technical issues of getting rid of chemical weapons. Soon a Soviet delegation is expected to visit a small-scale, prototype U.S. facility at an Army base in Tooele, Utah.

Lethal Weapons

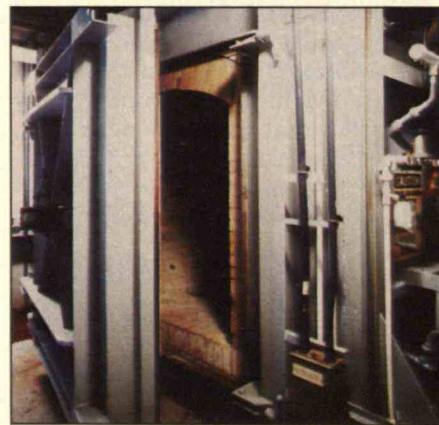
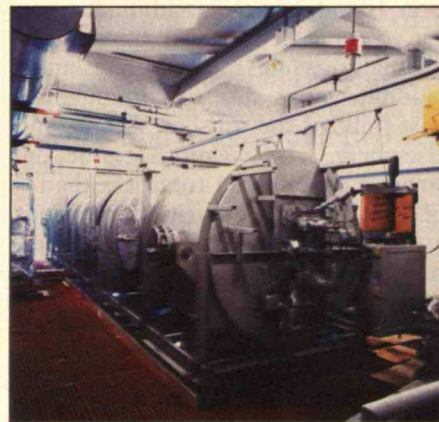
This June, the completed Johnston incinerator burned—and thereby detoxified—its first chemical weapons. Full-scale operations began soon thereafter.

Army chemists say the facility should emit fewer toxics than many incinerators that burn U.S. trash. Trash incinerators must handle a wide range of unknown materials, but the chemical compositions of the nerve, mustard, and blister agents slated for burning are well-understood. Moreover, the Army cites the state-of-the-art design of JACADS, including an explosive-proof, automated assembly line to take the weapons apart, the system's 2,700°F heat for burning the liquid chemical agents, and an elaborate scrubber system for emissions.

Nevertheless, the sheer quantities of

Top: The special incinerator for liquids should destroy all chemical agents and organic wastes in a fraction of a second.

Bottom: The metal-parts furnace will decontaminate scrap metal and the empty munition bodies.



weapons to be destroyed raise the possibility, however slight, that a deadly accident in the transport or disposal process could occur, as the Army's environmental impact statement outlines. The Johnston Island complex will handle more than 2,000 tons of some of the most lethal chemicals known—chemicals that can kill humans in amounts measured in micrograms.

To complicate matters, the once-uninhabited tiny island is now "extremely crowded" with 1,100 workers the United States has brought in to operate the facility. Army spokesperson Marilyn Tischbin points out that each worker is constantly on guard against a potentially lethal mishap—regular drills send the island's inhabitants reaching for their gas masks and dashing to a specially pressurized building for safety. "The first thing that happens when you arrive at Johnston Island," says Tischbin, "is you get your protective mask fitted."

Finally, while the remote island's mandate looks sure to continue, the vast bulk of the job lies ahead—and elsewhere. The weapons to be destroyed at Johnston total less than 7 percent of the U.S. chemical weapons awaiting disposal. The other 93 percent are slated for burning at eight military facilities in the continental United States—in Alabama, Arkansas, Colorado, Indiana, Kentucky, Maryland, Oregon, and Utah—and public opposition is mounting.

Greenpeace, which campaigned against the Johnston incineration, favors monitored storage of the weapons until a more environmentally benign disposal scheme is developed. "Our serious concerns over the environmental damage caused by incineration continue," says spokesperson Sebia Hawkins. "The fight over incineration here in the United States has just begun." ■

SETH SHULMAN, a Technology Review contributing writer, is working on a book about military toxic wastes.



Graceful Saving

What do 45-million-year-old spruce cones, 4,600 turkey feathers in Big Bird's costume, 15,000 volumes of nineteenth-century court records, and a spider's web have in common? All are being preserved with a novel application of a 30-year-old substance called parylene.

For two years, North American museums have been applying the tough plastic to organic materials threatened with imminent decomposition. With chemical properties similar to Teflon, parylene boasts a unique trait. Because it goes directly from a gas to a solid, it can be laid down in a film of singular thinness.

At Union Carbide's Nova Tran laboratory in Clear Lake, Wis., researchers have applied parylene coatings as thin as 100 angstroms—about one five-thousandth the thickness of a human hair. Moreover, parylene can be applied in layers one molecule thick, so it can follow contour changes of 10 angstroms across.

Big Bird's feathers used to be too fragile to clean. With a parylene treatment (right), they go in a washing machine.

In fact, parylene can be applied so finely that it is invisible to the eye and the touch. "Varnishes and sealants fill in cavities," says Ronald Seguin, head of display preparation at the Canadian Museum of Man in Ottawa. "But this coats a bit like a topographic map." To pitch the process, Nova Tran affixes a butterfly to its business card. The wings are supple and feel rough to the touch.

For preservation, parylene has two additional important qualities. An analysis by the Canadian Conservation Institute suggests that the coating could survive 10,000 to 100,000 years in darkness before losing half its strength. And it's chemically inert, so parylene won't react with gases that other materials in an exhibit may emit. For the same reason, parylene coats pacemakers and other medical devices implanted in the body, and it protects satellite parts and computer circuit boards.

To understand why museum conservators are experimenting with the coating, consider the special problems faced by David Grattan of the Canadian Conservation Institute. Fresh-looking leaves, needles, cones, and even entire tree trunks have been frozen in a glacier on Axel Heiberg Island in Canada's Northwest Territories for perhaps 45 million years. When the sodden fossil material is removed from the ground, it soon dries and turns to powder.

In 1988 Nova Tran sent one of its \$100,000 parylene-depositing machines to Ottawa, where Grattan treated various tree cones and matted leaves from the glacier. The result was extraordinary. "They were completely handleable. I have actually dropped one and nothing happened," says Grattan.

Since then, Grattan has asked other Canadian museums to send fragile,



left the fragments rigid and discolored. The parylene treatment produced a "peat cloth" that can be "picked up, probed, poked with metal needles," says Adovasio.

The producers of "Sesame Street" hired Nova Tran to treat \$3,000 worth of dried turkey feathers in Big Bird's costume. The feathers' ends had previously frayed, but now they can be put through a washing machine, scrubbed with an abrasive cleanser, and blown dry.

The technique appears to be particularly good for wet or charred materials. Researchers from the Soviet Academy of Sciences visited Clear Lake to see if parylene could save

biologic material to Ottawa for treatment. The Provincial Museum of Alberta sent a variety of eggs from a traveling exhibit. The Province of Quebec's National Archives sent a few of its 15,000 nineteenth-century court records whose covers were flaking away due to a decomposition process known as red rot. The parylene coating has stopped the decay.

The Royal Ontario Museum in Toronto applied the treatment to two 2,500-year-old Egyptian mummy hands. Before treatment, they were "powdering away," says museum conservator Helen Coxon. "We have solved that problem without any notable change in appearance," she adds. Seguin conserved a spider web, although the web is so fine that even parylene imparted an unnatural look.

Rescuing Big Bird

Textiles are also prime candidates for treatment. Archeologists are applying parylene to the so-called Windover textiles—cloth wrapped around Indian bodies preserved in a Florida bog for 7,500 years. The cloth seemed intact but had actually turned to peat, which disintegrated when touched, notes University of Pittsburgh anthropologist James Adovasio. Traditional methods of preserving the material



The parylene-coating system (above) won't work on leather, wood, or living things. It's ideal for preserving old or scorched books, though (right).

some of the 3.5 million books damaged in a 1988 fire. Ironically, the successful treatment of one scorched book created a problem for the cash-strapped Soviets. Parylene preservation is expensive—Nova Tran's Humphrey suggests \$15 to \$100 per book. Barbara Rhodes of the American Museum of Natural History thinks the cost could easily be \$100 to \$200 per book.

Still, parylene is far from a save-all for any situation. The process can't help materials that drying can damage, since the gas-deposition treatment requires placing an item in a vacuum. This removes up to 95 percent of the water and can crack or shrink objects such as leather, wood, and living things.

Perhaps the largest problem is philosophical. Once applied, parylene is forever, violating the modern conservator's creed that all preservation processes must be reversible. "We have all learned that conservation in the past destroyed future research possibilities," says Mary-Lou Florian, chief of conservation services at the Royal British Columbia Museum in Victoria.

While accepting this conservative strategy, parylene advocates suggest that sometimes it is the only available treatment. "When you have a technique like this you have to start thinking about the meaning of the ethics again," says Grattan. All techniques change what they preserve, so arbitrarily rejecting parylene "is a bit like saying four legs good, two legs bad." ■

STEPHEN STRAUSS is a contributing writer for Technology Review and a science writer at the Toronto Globe and Mail.



Hypertension: A Discriminating Disease

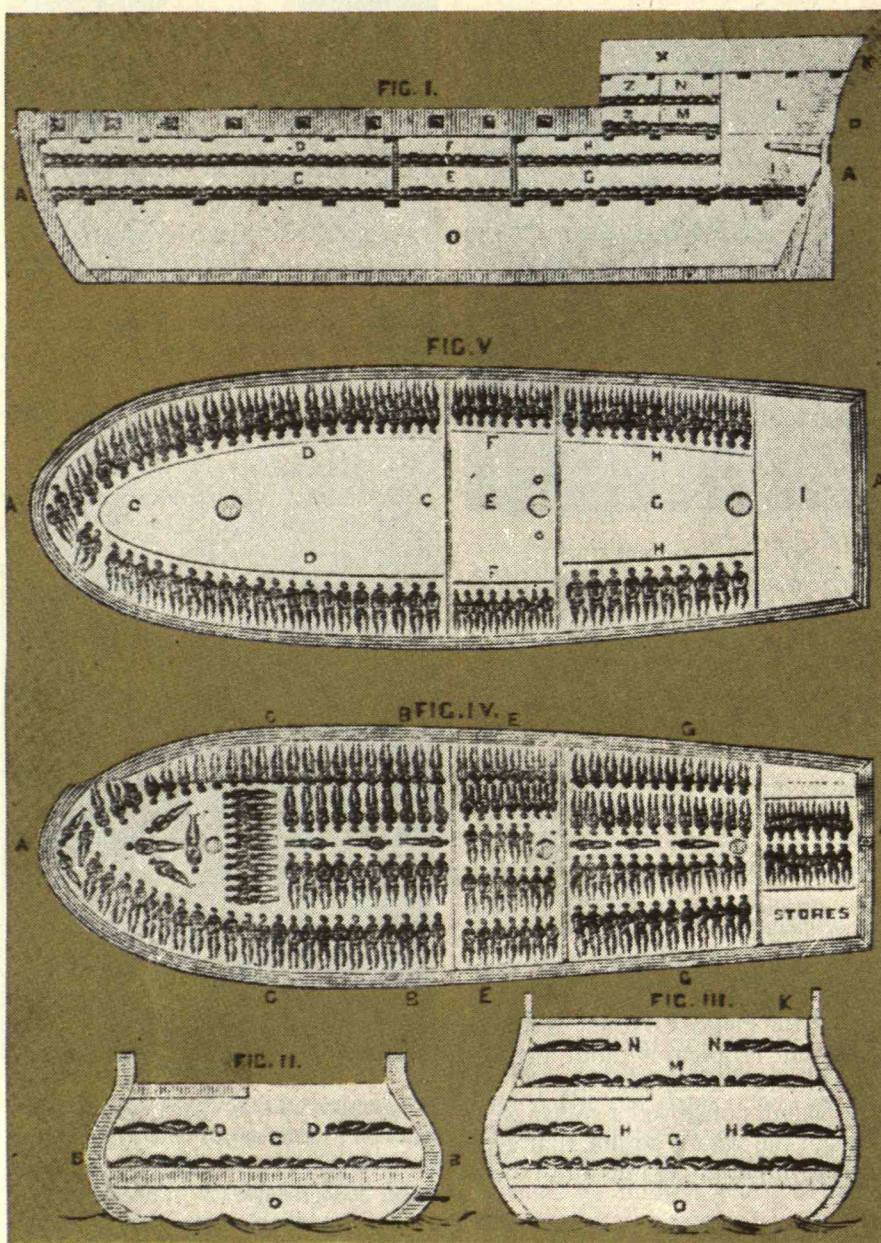
Since the 1920s, scientists have known that African Americans suffer more from high blood pressure than do Caucasian Americans. Some researchers now suggest that these and certain other ethnic differences may be a Darwinian result of susceptibility to salt.

Growing evidence supports the idea that diet, particularly salt consumption, plays a critical role in hypertension—abnormally high blood pressure that affects 60 million Americans and contributes to stroke, heart failure, and senile dementia, among other diseases. Hypertension arises from a malfunction of the biochemical mechanisms controlling the body's circulatory system—mechanisms scientists are just beginning to understand. The cause of nine out of ten hypertension cases remains a mystery.

The central role of salt is one implication of a 32-nation study called Intersalt. University of London physician Paul Elliot reported at the Fifth International Interdisciplinary Conference on Hypertension in Blacks, held in Long Beach, Calif. The study indicates that consuming less sodium and alcohol can cut blood pressure enough to reduce coronaries by 9 percent and stroke by 14 percent in 45- to 54-year-olds. About 40 percent of the reduction appears to come from lowering salt intake.

Equally suggestive are Intersalt's findings among three ethnic groups whose diet contains very little sodium: the Yanomamo and Shingu Indians in Brazil and the Highlanders in Papua, New Guinea. Scientists found no evidence of hypertension among these groups. Moreover, blood pressure declined with age, although it increases in most of the world.

"The characteristic of these groups is a level of salt consumption 50 per-



cent lower than that of Americans," comments Clarence Grim, an expert in hypertension at Drew University of Science and Medicine in Los Angeles. "If we can reduce our level of salt consumption, hypertension may disappear altogether."

Still, there are complicating factors. For example, individuals respond differently to changes in levels of salt. When Japanese hypertensives were

The slaves' difficult journey to the New World could explain why African Americans today are so susceptible to hypertension. Above: Built to accommodate 451 people, the Brookes may have carried as many as 609 slaves. Men were housed forward on the lower deck (c) and on platforms (d). Boys were carried in the middle (e and f), and women were aft (g and h). Only in 1788 did the English Parliament regulate slave ships at all.

placed on a salt-restricted diet, blood pressure did fall in half the subjects—but it rose slightly in the others.

The reason for ethnic variations may be natural selection, argues Derek D. Denton of the University of Melbourne. He proposes that over millions of years, selection pressure in sodium-deficient areas, such as the interiors of most continents, may have favored people with a taste for, and a capacity to conserve, salt.

A Legacy of Slavery

That application of Darwinian theory arouses less controversy than one suggested by Grim and Drew biohistorian Thomas Wilson. They have proposed that the high rate of hypertension among African Americans results directly from the slave trade that lasted from the sixteenth to the nineteenth centuries.

While the differing propensity of African Americans and Caucasian Americans to hypertension is well known, experts recently determined that the former are also more sensitive to salt than are native Africans. Moreover, Drew scientists have found that the blood pressure of native Africans living in the United States drops substantially at night, while that of African Americans doesn't. Previous studies had established that Caucasian Americans' blood pressure also tends to be lower at night.

Grim and Wilson consider that these and related physiological contrasts lend circumstantial support to their controversial hypothesis. They propose that severe conditions on the roughly two-month voyage to the Americas favored the survival of people who retained more salt. Every year, 16 to 28 percent of the Africans forced onto the voyages died.

Because the body's electrolyte balance, in which sodium is one key factor, is its first defense against illness, "salt conservers" had a better chance to survive, say Grim and Wilson. The descendants inherited the trait—and a

susceptibility to hypertension that goes with greater salt retention.

In the past year, Wilson has gathered historical evidence to support the argument. First, eighteenth-century shipboard surgeons reported that most deaths resulted from salt-deficiency illnesses. Using bills of lading from 130 voyages made by British slavers, Wilson has established that captured Africans were fed a typically high-salt European diet. The shift from a customary low-salt African diet would confer an advantage to salt-conservers because their bodies would rapidly build up high levels of sodium. That would better protect them from sodium loss due to perspiration, diarrhea, and vomiting, so they'd be less susceptible to the salt-deficiency illnesses that were a major cause of death on the voyages.

There are those, like William Dressler of the University of Alabama in Tuscaloosa, who discount this idea. Dressler maintains that socioeconomic factors adequately account for the high level of hypertension among African Americans. His research is based on the connection between stress and blood pressure.

In several studies, Dressler has determined that the greater the incongruity between actual and desired lifestyles, the higher an individual's stress and blood pressure. "In the American Black population, the lack of economic opportunity increases the incongruity."

While no one doubts that stress affects blood pressure, advocates of restricting dietary sodium point out that persuading individuals—and the food industry—to use less salt is probably more feasible than curing the stress of economic inequality. Says Grim: "The potential for lowering the entire population's blood pressure by reducing salt consumption is at least worth testing." ■

DAVID SALISBURY is a veteran science writer who currently works at the University of California, Santa Barbara.

AT THE MOVING FRONTIER



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How to Make Space Launch Routine

*The technologies are now in place to build a
hypersonic National Aerospace Plane (NASP)
that could inexpensively ferry
payloads into earth orbit.*

SINCE the last moon landing in 1973, the momentum of the space shuttle has dominated U.S. space launch programs. Here was a vehicle, we were told, that would make access to space routine. It would launch satellites, carry supplies to build a space station, and provide a zero-gravity platform for scientific research and, ultimately, industrial production. During the early 1980s, our national policy relied almost solely on the shuttle as our means of reaching earth orbit.

This policy was doomed from the start. The shuttle is too costly, too complex, and too inflexible to support today's space access needs. Moreover, overreliance on any single system leaves us extremely vulnerable in the event of an accident; after the Challenger tragedy, U.S. access to earth orbit virtually disappeared for almost three years.

After 20 years, it is no surprise that a system begins to look dated and inadequate. But addressing these realities head-on has often been awkward, even painful, because so much money and effort has been invested in the current launch systems and because there is no replacement system immediately on the horizon.

BY GEORGE A. KEYWORTH II AND BRUCE R. ABELL

The shuttle is too costly, complex, and inflexible for today's space needs.

HOW THE NASP STACKS UP

	PAYLOAD (LBS.)	LAUNCH COST (DOLLARS PER LB. OF PAYLOAD)	TYPICAL LAUNCH DELAY (DAYS)*
Shuttle	50,000	4,300	30-60
Titan IV	50,000	2,700	147
Pegasus	500	10,000-15,000	7
ALS	100,000	300-1,600	?
Ariane V	22,000-40,000	3,000	40-50
NASP	30,000	50-400	3-18

*After payload delivered to launch site

But one research program now under way offers hope for precisely the kind of workaday access to space that shuttle proponents once envisioned: the National Aerospace Plane, or NASP. Unlike other launch vehicles that exist or are being developed, this aircraft would take off from a runway. It would then hurtle through the atmosphere at more than 20 times the speed of sound (Mach 20), deposit its payloads in low earth orbit, and finally descend and land on a runway.

NASP has been publicly perceived as primarily a hypersonic aircraft, intended for high-speed transport on earth, or as an exotic military reconnaissance or rapid deployment aircraft. (Conceived in the late 1970s by the Defense Advanced Research Projects Agency, NASP has been funded since 1985 through a joint NASA-Air Force program office at Wright-Patterson Air Force Base.) When the program first entered the public spotlight, much was made of the idea of an "Orient Express" that could carry passengers from New York to Tokyo in one or two hours.

But the technology's most immediate impact will be in space access. More than any other launch vehicle now being considered, NASP would provide low-cost and flexible access to space. Unfortunately, plans for post-shuttle space-launch systems have not yet seriously in-

cluded vehicles using NASP technologies.

Growing Space Needs

The United States faces a serious shortage of lift capacity. Right now the U.S. fleet is able to launch about a million pounds a year into low earth orbit. That does not even adequately cover the "official" launch demand compiled by the Air Force Space Command.

And demand will surely increase in coming years. The need for communications satellites will continue to grow as direct-broadcast television services are put into place around the world. Further demand will come from a proliferation of satellite-based navigation and position-locating systems; a new generation of earth-sensing programs, including the ambitious Mission to Planet Earth; and a backlog of planetary exploration projects. Moreover, military need for space access will increase, not decrease, as international tensions ease and surveillance supplants readiness as the basis for national security. When nations reduce defenses, they put a higher premium on intelligence—the old adage trust but verify.

Many of these missions could be served by unmanned launch vehicles. But if the United States seriously wants to build a space station or explore Mars—both proposed national goals—it will need a way to get people as well as payloads into orbit cheaply. Interplanetary manned exploration in particular will be unrealistic unless we reduce the cost of access to space.

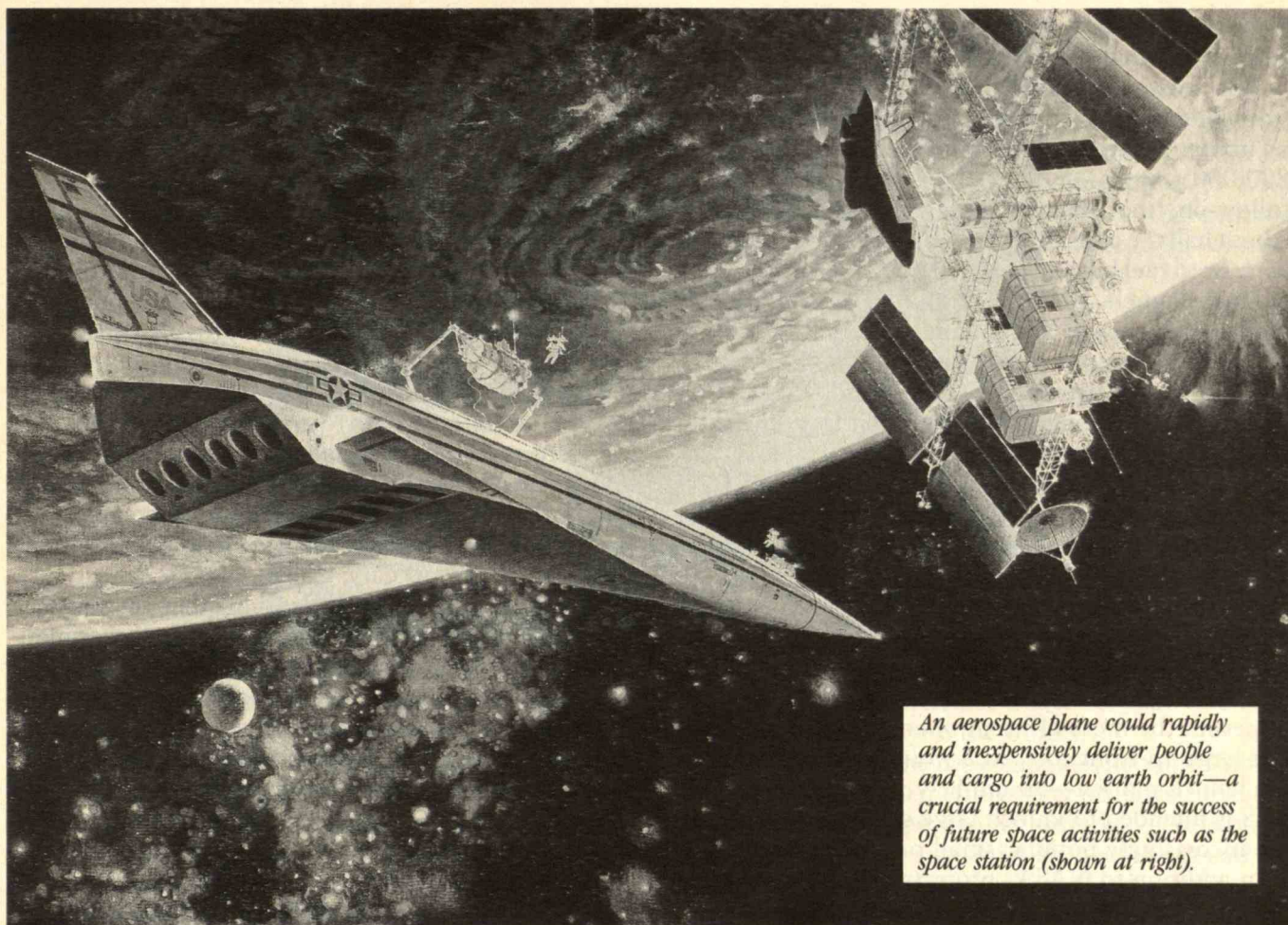
But more importantly, there is a huge class of potential users of earth orbit who cannot afford present launch systems. Each shuttle launch costs about \$275 million, or \$5,000 per pound of payload. Unmanned rockets are less expensive, but not dramatically; it costs about \$150 million to put up a workhorse like the Titan, or about \$3,000 per pound of payload. These costs form a high barrier to participation. Many more users will surface if prices drop to the \$20 to \$200 per pound range promised by NASP.

Providers of communications services other than for mass broadcast, for example, could take advantage of networks of satellites in low earth orbit (rather than in higher geosynchronous orbits). The idea of growing new kinds of materials in space—which so far has been essentially a stunt given the high cost of shuttle launches—could become economical.

Shuttle launches are not only expensive, but also infrequent. Routine access means frequent launches and it means the ability to launch on relatively short no-

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An aerospace plane could rapidly and inexpensively deliver people and cargo into low earth orbit—a crucial requirement for the success of future space activities such as the space station (shown at right).

tice. Yet after 40 years of space access with rockets, the United States is still a long way from that capability, even for unmanned systems.

Another element of routine access is the ability to carry a wide range of payload sizes. The space shuttle is designed to carry one or at most two large payloads. But this practice is anachronistic. Very few things that we want to put into space are the size of the Hubble space telescope. Most projected flight requirements would require a payload of no more than 25,000 pounds.

This shift toward smaller payloads is becoming particularly apparent in the growing popularity of small, cheap satellites. Conventional satellites, with their billion-dollar price tags, are the space-borne equivalent of mainframe computers. Each multi-ton unit takes a decade (or longer) to build. Moreover, launch times must be reserved years in advance. Small satellites, typically weighing 50 to 1,000 pounds, are more like per-

sonal computers; they can be assembled quickly from inexpensive and accessible hardware and launched on short notice. And like the PC, as small satellites become more available, people will find unexpected new uses for them, further stimulating demand for launch services.

The move toward PC-equivalents in space is particularly important for scientists studying the earth. Missing from attempts to create realistic models of natural systems has been the ability to make large numbers of observations. We could learn more about the dynamics of global warming, for example, with 500 100-pound satellites than with one 50,000-pound satellite.

Looking Beyond the Shuttle

The shuttle's high cost and inflexibility have brought forth a number of proposals for alternative launch ve-

*With air-breathing engines capable of Mach 22,
NASP will need to carry only enough oxygen to fire the rocket
motors for a final 'kick' into orbit.*

hicles. But most of these would suffer from the same deficiencies that mark the shuttle.

The most ambitious goals for reducing cost come from NASA's planned Advanced Launch System (ALS), an unmanned rocket that could carry cargoes of up to 200,000 pounds—more than the shuttle or its planned follow-on, the Advanced Manned Launch System. About half the cost of a shuttle launch goes not to hardware or to fuel but to operations; 12,000 people work on each launch. Developers of ALS aim to improve launch efficiency by simplifying operations and trimming this enormous personnel cost. Their target is a payload cost of about \$300 per pound.

This order-of-magnitude reduction from the shuttle's cost is a laudable but not very credible goal. The ALS is, at its core, an extrapolation of well-mined technology. It shares the inherent inefficiencies of all multistage rockets—the costs of hauling expendable superstructure and liquid oxygen into space, for example. A recent study by the Office of Technology Assessment (OTA) projects an R&D cost on the order of \$7 billion to develop the ALS, with an additional \$4 billion for the new launch facilities that would be required to permit the more efficient operations. To pay back this large up-front cost, ALS would have to dominate the launch market—an unlikely prospect, given that ALS is intended to launch large satellites rather than the increasingly popular small ones.

In addition to NASA's projects, a number of commercial firms are promoting a class of small launch vehicles. One innovative example is the Pegasus, the air-launched version of which was successfully tested early this year. Like the old X-15 rocket plane, Pegasus is carried aloft under the wing of a large airplane and then drop-launched. The rocket expends no fuel until it reaches an altitude of perhaps 50,000 feet.

Small launchers such as the Pegasus or Space Services' Conestoga rocket are suitable for these smaller payloads, and satellite manufacturers are now designing and building families of small satellites sized to fit into these launch vehicles. Four of Ball Aerospace's Techstars, for example, can nest into the Pegasus housing. But lacking economies of scale, per-pound launch costs are still high—\$10,000 to \$15,000 for Pegasus, several times those of the shuttle.

The limitations of all these multistage, expendable launch vehicles have led some people to reexamine the idea of a launch system that climbs from the ground into orbit with a single rocket stage. The inherent difficulty of single stage to orbit, or SSTO, is the weight

penalty of carrying the whole launch vehicle into orbit. For this reason, early rocket developers produced vehicles with expendable stages that are jettisoned after they use up their propellant. Over the years, engineers got comfortable with staged rockets, sometimes forgetting that a design decision based on technology of the 1950s and 1960s might be worth revisiting.

Technological developments are making nonexpendable SSTO launchers a more sensible alternative. Fuel tanks made from composite materials, for example, are much lighter than before. New designs also make possible lighter weight and more efficient rocket motors. Novel engine-control systems would continuously vary the fuel-to-oxidizer ratio to maintain the most efficient mixture as the vehicle climbs through the thinning atmosphere. This concept has recently been advanced by the work of a small number of innovators, notably Gary Hudson through his start-up, Pacific American Launch Systems (Redwood City, Calif.).

Developers of SSTO vehicles think they can substantially reduce launch costs. The Spaceship Experimental (SSX), for example, a vertical-takeoff and vertical-landing manned vehicle being developed by the Strategic Defense Initiative Office, aims for payload costs a fraction of the shuttle's. However, this manned, reusable vehicle is still a paper design.

Rocket on a Runway

Unlike the shuttle or any of the other proposed alternatives, a NASP vehicle would offer frequent and low-cost access to low earth orbit without the complexities of a rocket launch.

NASP vehicles will use a jet engine to fly to hypersonic speeds and high altitudes. Equipped with massive air intakes, they should ideally reach Mach 22 (about four miles per second) in air-breathing flight. Rocket motors would accelerate the craft to Mach 24, the velocity needed to enter earth orbit.

Eliminating the need for rocket power from the ground to around 200,000 feet would reduce launch costs enormously. And unlike rockets, a NASP vehicle would not have to carry enormous tanks of liquid oxygen to use as the oxidizer for its hydrogen fuel. The craft will need to carry only enough on-board oxygen to fire the engines briefly for a final "kick" into orbit, to maneuver in space, and eventually to re-enter the atmosphere.

A NASP-derived vehicle would compare favorably with other space launch technologies. According to a

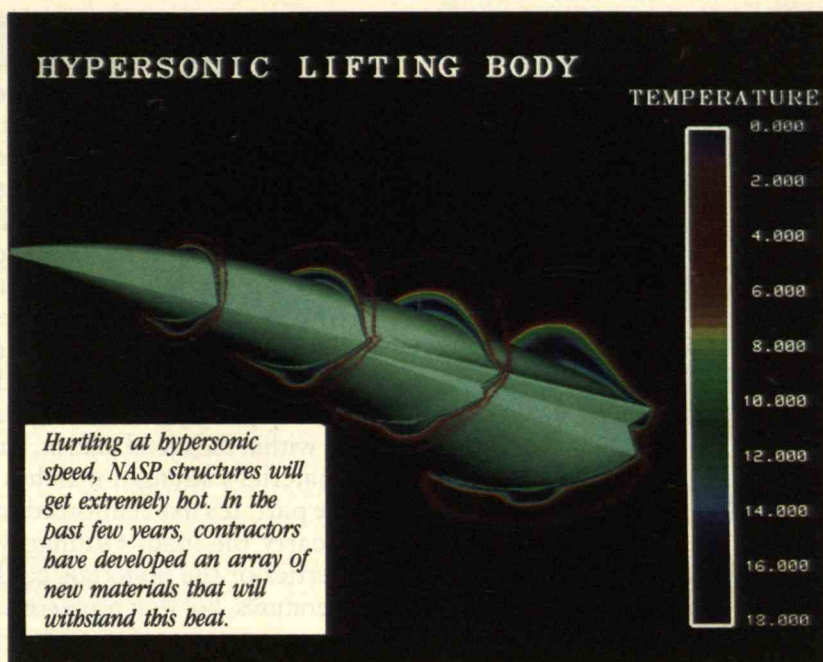
May 1990 study by OTA, the cost to launch an aerospace plane would run between \$800,000 and \$4.4 million per flight, for a payload of 20,000 to 30,000 pounds. That's far more economical than the shuttle, with its nominal launch cost of \$275 million.

The NASP's cost advantages stem primarily from its similarities to ordinary aircraft. Operating out of an airport and taking off from airport runways roughly the size used by commercial airliners, NASP vehicles could be launched frequently. According to plans developed by the NASP program office, a NASP vehicle could typically take off 24 to 36 hours after landing. Where rockets often sit in hangars and on the launching pad for weeks or months while the payload is loaded and all systems checked, NASP payloads and fuel could be loaded just a few hours before takeoff. A NASP vehicle will require inspection similar to that given an airplane—not the intense scrutiny required by a rocket. (If NASP suffers a mishap after takeoff, it can simply turn around and land again; the shuttle and other rockets risk total destruction.) And NASP will not be much more sensitive to weather conditions than airliners are. By contrast, the shuttle often waits days for acceptable launch conditions. Finally, while safety considerations usually force rockets to be launched over oceans, NASP could fly over land. This flexibility gives NASP the advantage of access to virtually all low-earth orbits.

Enabling Technologies

NASP relies on two critical technologies: an engine that can achieve hypersonic flight with little or no rocket assist, and structural materials that withstand high stress and high temperatures. Recent developments in both areas are encouraging.

When NASP was first proposed as a national pro-



gram in 1985, there was widespread skepticism that high-performance materials could be developed to hold up to the extreme operating conditions. This lack of suitable materials has essentially been solved. Early in the NASP program, the major contractors—General Dynamics, Rocketdyne, Pratt & Whitney, McDonnell-Douglas, and Rockwell International—formed a consortium devoted

to materials research for the NASP. Each contractor is responsible for a particular materials class and then sharing the results with the others.

Over three years, the five companies have spent about \$160 million, and their efforts have produced an array of materials that appear to withstand any anticipated stress. For example, structural elements in the air inlets or exhaust nozzles and near the leading edges will have to withstand temperatures of up to 3,000 degrees Fahrenheit. Traditionally, in other systems, those surfaces are faced with carbon-carbon (C-C) composites (carbon fibers embedded in a carbon matrix). At high temperatures, however, the C-C material oxidizes and erodes. This is why shuttle materials have to be replaced routinely.

The solution—considered highly improbable just two years ago—is a self-healing, glasslike coating for the C-C's surface. This coating prevents oxidation and withstands extreme changes in temperature. The design goal is for this material requirement to survive 150 flights without needing refurbishing. It has already withstood more than 250 flight demonstration cycles. General Dynamics is now making four-by-ten-foot structural panels of the C-C material. These panels are one-third the weight of conventional titanium structures, yet they withstand three times the temperature.

For structural components that don't experience quite such extreme temperatures, a team led by Rockwell International has developed a new form of

Because of its similarity to an ordinary airplane, a NASP vehicle could typically take off 24 to 36 hours after landing.



Top: Testing aerospace plane engine technology requires hypersonic wind tunnels, such as these at Aerojet Propulsion in Sacramento.

Bottom: Engineers check a scale model of an engine inlet in a Mach 5 wind tunnel at NASA's Lewis Research Center in Cleveland.

titanium-aluminide (Ti-Al). Ordinarily, Ti-Al tends to be brittle when rolled into flat sheets. This new form, strong up to 1,300 degrees Fahrenheit, is produced by a new hot-rolling technique that assures uniformity of strength throughout the entire sheet. The sheets are now being fabricated into large structures using a diffusion bonding method that structurally links pieces of metal at the molecular level. Diffusion bonding eliminates the need for welding, which can weaken the material.

For critical areas where the enhanced Ti-Al is not strong enough, Rockwell has developed another version of the alloy that is reinforced by embedded silicon-carbide fibers. By controlling the orientation of these fibers within the metal matrix, engineers can assure that the material's strength matches the expected loading on the part. It's like reinforced concrete, in which steel rods carry the load. Ordinarily, different expansion properties of the materials cause failure at very high temperatures, but that problem has been solved by high-purity processing. Contractors are also now producing four-by-ten-foot structures of this reinforced titanium-aluminum material, including wing cross-sections that can withstand temperatures up to 1,500 degrees F.

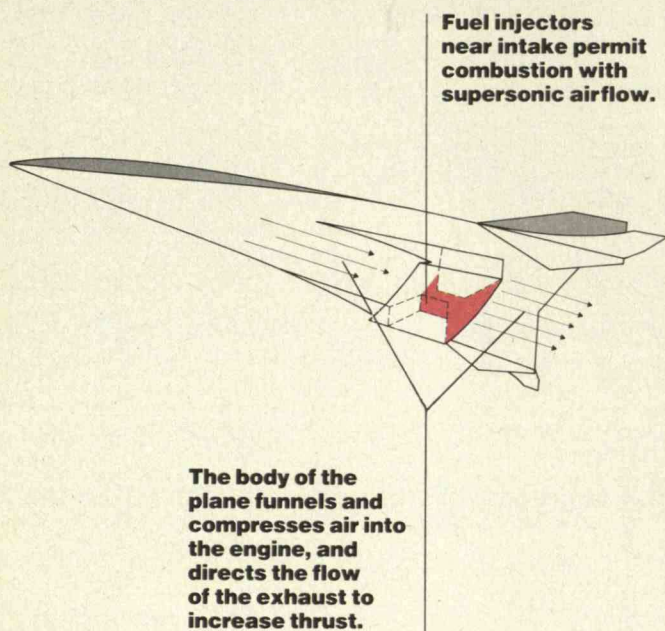
The payoffs of this materials engineering will extend well beyond NASP. In particular, the ability to design a material's properties to match the stress it must bear is likely to significantly influence product design and manufacturing. Ten years from now, manufacturers may routinely design three-dimensional materials properties into their products thanks to the innovations of NASP developers.

Most essential to the NASP concept is its engine technology. The optimistic design objective is for these engines to propel the aircraft nearly all the way to orbit without rocket assist. So far that optimism is unshaken.

NASP's innovative propulsion system is a variation on a well-developed engine type called a ramjet. The entire front of a NASP vehicle would function as a large air collector, and the geometry of the structure would form the compressor. The massive amounts of machinery used in standard turbojets to compress the airflow would simply not be required. When the vehicle reaches hypersonic speeds, the engine will function as a "scramjet" (supersonic combustion ramjet).

Although the NASP test aircraft (designated the X-30) will not fly for several years, ground tests of the engine, as well as supercomputer simulations, have been encouraging. Engine efficiencies have reached about 70-80 percent, closing in on the goal of 90 percent—

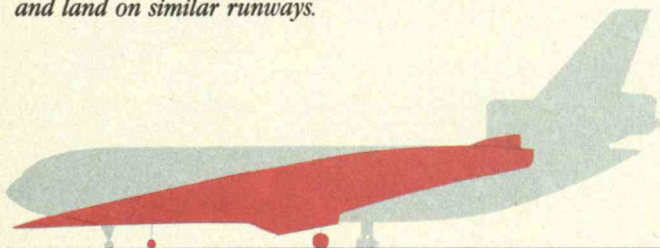
HOW THE NASP ENGINE WORKS



comparable to a typical turbojet. Nearly 50 wind-tunnel tests of scaled versions of the engine have simulated speeds of up to Mach 8, and there is strong confidence in the engine performance up to about Mach 10 or 12. Shock-tunnel tests well under way permit some analyses up to Mach 22.

As a manned, reusable vehicle, NASP will have the advantage of repetitive flight testing. These tests will allow designers to refine the operating characteristics and gauge the vehicle's performance, step by step, as it begins to probe unprecedented altitudes and speeds. And unlike a rocket, the NASP can have varying degrees of success. A rocket that does not achieve orbital velocity is a dud. But even if NASP fails to go beyond Mach 15 or Mach 20 in air-breathing flight, it would

An aerospace plane (foreground) would be smaller than a DC-10, and could take off and land on similar runways.



still be very nearly in orbit. It would simply need to carry more oxygen than the ideal to get its final boost into space. (Additional acceleration at high altitudes requires relatively little thrust since there is virtually no air resistance.)

Building a Constituency


NASP has had a difficult time finding its niche in the government bureaucracy. Facing massive budgetary pressures, Secretary of Defense Richard Cheney recommended canceling the program in April 1989. Vigorous objections from within the Defense Department and NASA, plus a favorable review by the National Space Council, stayed the axe, but funding has been cut significantly. Congress appropriated only \$254 million for the program in fiscal 1990, down from the \$427 million that would have been required to meet the original timetable. As a result, flight testing originally slated for 1994 will not now begin until 1997, delaying the availability of an operational aerospace plane until early in the next century.

The NASP program competes with familiar technologies, both in space access and in high-speed flight, that have long-standing constituencies. Many in NASA, for example, still view NASP as a competitor to the shuttle and its shuttle-like follow-ons. But NASA is becoming a more enthusiastic participant in the program. At the same time, many senior Air Force officials have embraced the program, although budgetary pressures have often appeared to place NASP on the auction block.

As the NASP gets closer to flight testing and produces operational results, resistance should diminish. The NASP program is now developing technologies—most visibly in the area of high-strength materials and reusable engines—that will benefit almost any new approach to space access, including mainstream efforts such as the Advanced Manned Launch System. This spinoff potential will doubtless build stronger support for the NASP program.

But it would border on tragedy if parochial turf wars blocked NASP from progressing at least to the test flight stage. Automobiles made their full impact only when driving a car became more than a hobby practiced by eccentrics. Computers have revolutionized business and society to the extent that they have become inexpensive, readily available, and easy to use. And only when travel into orbit ceases to be a newsworthy event can we claim to have truly entered the Space Age. ■





*An international treaty
could be signed soon—if the U.S. can
overcome its ambivalence.*

Banning Chemical Weapons

BY JOHN ISAACS

ON September 25, 1989, President George Bush, in an address to the United States General Assembly, made a solemn promise to eliminate all chemical weapons from the face of the earth: "Today I want to announce steps that the United States is ready to take, steps to rid the world of these truly terrible weapons, towards a treaty that will ban, eliminate, all chemical weapons from the earth 10 years from the day it is signed."

Six months later, Iraqi President Saddam Hussein delivered a fiery speech to his armed forces threatening to employ deadly nerve-gas weapons against Israel in any future conflict: "I swear to God, we will let our fire eat half of Israel if it tries to wage anything against Iraq. We don't need an atomic bomb, because we have binary chemicals."

President Bush's soaring pledge and Saddam Hussein's grisly threat frame the debate over chemical weapons. Forty countries are negotiating in Geneva to



Bush:

The U.S. is seeking

'a treaty that will

ban, eliminate, all

chemical weapons

from the earth.'

complete an international convention designed to bring about the destruction of the world's chemical weapons stockpiles. These negotiations are complicated by the need to eliminate an entire category of weapons without inhibiting the production of chemicals for civilian purposes, and to satisfy the competing requirements of countries with very different views on the utility of chemical weapons.

Although Hussein's threat remains to be dealt with, that is not the main obstacle to completing the international convention. Ironically, the primary holdup for the last year and a half has been the negotiating roadblocks thrown up by the United States. While arguing eloquently for an international treaty, the Bush administration has confounded allies by building up U.S. chemical weapons stocks and by advancing non-negotiable proposals counter to the

spirit of the Geneva talks. For example, the United States insists on retaining a small portion of its stockpile until all other countries have gotten rid of theirs.

The world has in its grasp a rare opportunity to wipe out a whole deadly class of weapons. Most countries are prepared to renounce these weapons if other nations will join them. For an agreement to be reached, however, the Bush administration will have to be prepared to make bigger concessions at the negotiating table and match its actions to its words.

JOHN ISAACS has been legislative director of Council for a Livable World in Washington, D.C., since 1978. He writes frequently about nuclear and chemical arms control issues for *The Bulletin of the Atomic Scientists* and other publications, and has worked on chemical weapons issues for the last decade.

Why Chemical Weapons Should be Outlawed

ALTHOUGH a ban on chemical weapons will not halt the terrible destructiveness of modern warfare, it is essential to draw a line on the battlefield between conventional weapons and weapons of mass destruction—chemical, biological, and nuclear. Eliminating chemical weapons is important because they kill indiscriminately, without warning, and in a most cruel fashion. They work by releasing toxic chemicals that attack the biochemical processes of living organisms. With the older blister agents such as mustard gas, a liquid or vapor attacks the skin, eyes, and lungs. In World War I—which brought the first large-scale use of chemical warfare—blister agents killed some 90,000 soldiers and injured up to a million people. Iraq also used mustard gas against Iranian troops in the mid-1980s.

Modern nerve-gas agents kill by disrupting the nervous system, causing convulsions, uncontrollable vomiting and diarrhea, coma, and finally asphyxia by respiratory paralysis. Death comes within minutes or hours, depending on the type of nerve gas and the dose. A sublethal dose may cause long-lasting neurological and psychiatric disorders.

In December 1987, the United States began producing a new generation of chemical weapons that consist of two less toxic chemicals in separate containers. The chemicals mix to make nerve gas only after the weapons are on the way to their targets. Although these "binary" weapons are ostensibly safer to produce, store, transport, and eventually destroy, the resulting nerve agent is no more or less deadly than that of earlier "unitary" weapons.

The use of chemical weapons in World War I and since has shown that they are effective mainly against unprepared military forces—and civilians. Well-equipped armies,



Iraq's Hussein:

'We don't need

an atomic bomb,

because we have

binary chemicals.'



*In World War I,
blister agents
killed some
90,000 soldiers
and injured
up to a million
people.*

such as those of NATO and the Warsaw Pact, can protect themselves with gas masks and special clothing. Civilians usually cannot. Clouds of nerve gas can drift quickly in wind currents from a battlefield to nearby towns, killing and maiming most inhabitants. In a chemical war in Europe, according to chemical weapons experts, 20 or more civilians would be killed for each military casualty.

The need for an international convention has become especially critical with the spread of ballistic missile technology. Mounted on long-range missiles, chemical warheads can inflict hideous damage far from the battlefield. During the Gulf War, Iraq and Iran attacked each other's cities with conventionally armed missiles. Iraq's heavy use of chemical weapons in the 1980s, combined with its lust for the most advanced armaments possible, makes the use of chemically tipped missiles more likely in the event of another war in the Middle East.

The dangers are compounded by the number of countries building up stockpiles. The U.S. government officially estimates that up to 20 countries have or are developing chemical weapons. Brookings Institution chemical weapons expert Elisa Harris puts the number at 15—Burma, China, Egypt, Ethiopia, France, Iran, Iraq, Israel, Libya, North Korea, the Soviet Union, Syria, Taiwan, the United States, and Vietnam—but adds that another 11 states *may* have such weapons. And the list could easily grow. Other countries may be encouraged by Iraq's escape from international censure to develop their own chemical weapons stockpiles. Or

they may feel a need to develop such weapons as a deterrent against neighboring governments that have them. If chemical weapons become more fashionable, terrorists may move toward acquiring them.

An international convention will not provide an absolute guarantee against the spread of chemical weapons, but it will greatly diminish the likelihood of their proliferation and use. Countries will have less incentive to develop these weapons if they know that most other nations, large and small, are eliminating their stockpiles and agreeing not to produce any new ones. A convention will also lessen the perception of chemical arms as a legitimate form of warfare. And it can enhance international efforts to establish export controls to prevent developing countries from acquiring chemicals and technical assistance for producing such weapons. If the convention provides tough sanctions against violators, it could discourage future Iraqs and Libyas.

The Road to a Treaty

CONTROLLING chemical weapons has been an international concern since the shock and horror over casualties caused by poison gas in World War I. But a complete ban has proved a long, arduous undertaking. Early efforts culminated in 1925 in the signing of the Geneva Protocol. Although it forbids the use of chemical and biological weapons, the protocol does not bar countries from producing or possessing them. Many nations, including the United



*When Iraq used
chemical agents
against its own
Kurdish people,
it paid no
substantial penalty.*

States, have reserved the right to retaliate in kind if another state uses them first. Thus the protocol has become little more than a no-first-use prohibition.

In the late 1960s, discussion of a total ban on chemical weapons was renewed, in part because of the controversy over U.S. use of herbicides like Agent Orange in the Vietnam War. U.N. Secretary General U Thant, at the behest of the General Assembly, appointed a group of experts in 1968 to study the effects of chemical and biological weapons. In 1969, a debate over these weapons appeared for the first time on the General Assembly's agenda.

The first negotiations in what was then called the Eighteen-Nation Committee on Disarmament, under the U.N., began on a treaty to ban both biological and chemical weapons. But a number of Western countries, including the United States and Great Britain, argued for completing a treaty eliminating biological weapons before turning to chemical arms. They believed—correctly, as it turned out—that a biological weapons ban would be simpler and faster to negotiate. Eventually, the Soviet Union and other communist bloc nations agreed to separate the issues. The resulting Biological Weapons Convention was signed in 1972.

Since then, two sets of international treaty talks have proceeded. In 1972, 40 nations—including Western, communist, and Third World countries—began negotiating under the auspices of the U.N. Conference on Disarmament in Geneva. All other nations will eventually be asked to sign the chemical weapons treaty that emerges. Independent of these talks, President Jimmy Carter in 1977 launched bilateral negotiations with the Soviet Union on a comprehensive chemical weapons ban. Both sets of talks made only modest progress into the 1980s.

An important turning point came in 1984, when then Vice-President Bush presented a draft chemical weapons disarmament treaty in Geneva. That draft became the basis for negotiating a “rolling text,” a draft treaty that has been undergoing continuous modification. Today, the portion of the rolling text on which all 40 parties have agreed consists of 20 articles, eight annexes, and a protocol on inspection procedures, contained in some 130 pages.

The essential aim of the treaty is an agreement by all countries to refrain from developing, producing, acquiring, stockpiling, and retaining chemical weapons, or transferring them, directly or indirectly, to any country. Within 30 days of taking effect, the convention would require each country to reveal how many chemical weapons it has, and where. Signatories would have to begin destroying existing stockpiles within a year and complete the job within 10 years. All chemical weapons plants would cease production immediately and be completely dismantled within 10 years.

To ensure compliance, the draft convention provides for a three-tier verification system. First, international teams would inspect all chemical weapons stocks and factories, both immediately and during the destruction process. Second, measures would be taken to verify that the civilian chemical industry is not producing chemical weapons. For example, observers would conduct systematic on-site inspections and would carefully monitor the production of industrial chemicals that could be used in weapons. Third, “challenge inspections” would be used to deter violations and investigate suspected infractions. If international observers suspected illegal activity, they could demand to visit a plant on short notice.

Under the treaty, an International Organization for the Prohibition of Chemical Weapons would manage the verification process. This new organization would be modeled after the International Atomic Energy Agency, a U.N.-sponsored agency headquartered at Vienna that oversees compliance with the 1968 Nuclear



*The U.S. has
opposed banning
tear gas because
it is commonly
used in law
enforcement—say,
in breaking up
riots.*

Non-Proliferation Treaty. Its executive council, to be composed of representatives of 15 to 35 countries, would supervise a technical secretariat that would analyze all plans and reports submitted by the countries, and an inspectorate that would carry out all inspections.

Remaining Treaty Problems

ALTHOUGH the 40 remaining countries have managed to agree on some critical issues, the rolling text still contains many points on which consensus has yet to be achieved or that need further drafting.

Verification remains the most complex technical barrier to completing a treaty. One reason is that chemical weapons are relatively easy to make. In fact, any country with a sophisticated petrochemical, pesticide, fertilizer, or pharmaceutical industry can also produce lethal agents. That means verification efforts will need to be comprehensive enough to monitor the chemical industry worldwide—an expensive proposition. It also means that inspectors will have to avoid infringing on trade secrets—perhaps examining portions of chemical plants while leaving other areas off limits. The countries' chemical industries will have to agree that they can live with a high degree of intrusive inspection.

Although verification is complicated, the technical means for undertaking it have progressed. For exam-

ple, the United States and the Soviet Union have gained experience from the verification precedents developed for the 1987 Intermediate-Range Nuclear Forces Treaty. Under INF, both countries have established inspection teams to monitor the destruction of weapons and production sites.

The United States and other countries will also be able to use their own intelligence assets—so-called national technical means—to monitor compliance. Through satellites and other means, the United States was able to determine that Libya was building a chemical weapons plant, that it placed weapons production on hold after an international controversy, and that it then resumed construction and began producing weapons after the controversy died down. This monitoring was possible without any on-site inspection procedures. In fact, the two countries do not even maintain diplomatic relations.

Another factor that will help guarantee treaty compliance: a militarily useful supply of chemical weapons is relatively hard to miss. For example, some 600 truckloads will be needed to move the small U.S. stockpile of chemical weapons out of West Germany—according to one scenario, enough for 30 days of chemical warfare—under an existing U.S.-German agreement.

Related to the critical verification dilemma is the issue of sanctions against outlaw countries. When Iraq employed lethal chemical agents on Iranian military

forces and against its own minority Kurdish people, the country paid no substantial penalty, either in international condemnation or in economic sanctions. Both the Reagan and the Bush administrations argued that trade sanctions would jeopardize U.S. security interests in the Middle East while hurting American farmers by preventing them from shipping food to Iraq. Most other countries are reluctant to see sanctions mandated in any arms control treaty. They prefer the freedom to respond to violations in their own fashion.

Iran, however, is pressing to include penalties in the Chemical Weapons Convention. Indeed, sanctions that are mandatory and collectively applied would put teeth into a convention that might otherwise be hard to enforce. They could include suspending diplomatic relations, as well as economic penalties such as ending favored-nation trading status, halting exports and imports, freezing assets, and blocking loans from countries and international lending institutions.

A separate unresolved issue is whether the convention should ban irritant agents (tear gas) and herbicides. The United States has opposed including them, arguing that herbicides are usually nonlethal to humans, and that irritant agents are commonly used in law enforcement—say, in breaking up riots. On the other hand, virtually all other countries argue that if any kind of chemical warfare is allowed, the distinction between permitted and prohibited chemicals could break down. One possible solution would be to include a clause prohibiting the use of irritants and herbicides in armed conflicts, and allowing irritants to be manufactured only in forms that domestic police might use, such as grenades.

The most crucial political question remains whether all states will adhere to the convention. A number of key countries, including China, India, Israel, and South Africa, refused to sign the Nuclear Non-Proliferation Treaty in 1968. These countries argued that the treaty was discriminatory: the United States, the Soviet Union, and Great Britain could have nuclear weapons, but other countries could not. Although the Chemical Weapons Convention would treat all nations equally, no one can be sure that countries such as Iraq, Iran, Libya, Israel, and South Africa will sign the treaty. These countries have so far given mixed signals. And some Arab states, Iraq in particular, have claimed that their chemical weapons are necessary to deter Israel from using its nuclear weapons. They have suggested that they will not forswear chemical weapons unless Israel destroys its stockpile of nuclear weapons.

The main reason unanimous acceptance of the con-

vention is so critical is that the United States has made it a condition of accepting the treaty fully itself. The U.S. demands the right to retain 2 percent of its chemical weapons stockpile indefinitely, pending a judgment eight years after the treaty takes effect as to whether all nations able to build chemical weapons have agreed to sign.

The Bush administration may be trying to reassure conservatives that the United States will not destroy all its chemical weapons unless Libya and Iraq sign the treaty. But almost no other country among the 40 involved in the talks accepts this condition, which is contrary to the treaty as negotiated. Most countries feel that, far from shaking restive governments into compliance, this condition would encourage other countries to build up their chemical weapons supplies to match the residual U.S. stockpile. In the meantime, U.S. negotiators have yet to clarify a key element of this condition, the definition of a “chemical weapons-capable state.”

U.S. Contradictions

THE “2 percent solution,” in which the Bush administration treads a fine line between accepting and rejecting the treaty, is typical of U.S. ambivalence toward chemical arms control. On the one hand, George Bush wants to be known as the president who rid the world of chemical weapons. On the other, he has yet to organize his administration to achieve that goal or, seemingly, to overcome his fears of conservative opposition.

A week after the president’s U.N. speech in September 1989, for example, the *Washington Post* reported a secret U.S. decision to retain the option of continuing to produce a new generation of chemical munitions even after a convention is concluded. After much controversy in Congress and among our allies, the United States quietly abandoned this idea three months later.

Similarly, the United States has insisted on the right to use its remaining chemical weapons in a counterstrike against countries that fire such weapons first. Other countries object to this condition, regarding it as discriminatory in favor of the “chemical haves” and against the “chemical have-nots.”

Sometimes the U.S. position has been downright hypocritical. The United States launched an international campaign to dissuade Libya from opening a new chemical weapons plant. But U.S. hands were not clean. The Pentagon was in the midst of developing three new chemical weapons—a nerve-gas artillery shell, a chem-

Can a Chemical Weapons Treaty Survive in the Senate?

IF and when the Geneva negotiations bear fruit and produce a treaty, a major hurdle will be Senate ratification of the agreement. The Senate proved the graveyard of Jimmy Carter's SALT II Treaty, and has placed many procedural and political obstacles in the path of other treaties. Even Reagan's Intermediate-Range Nuclear Forces Treaty, eventually supported 94-5, got a rough going-over before the final vote.

The Senate could subject a Chemical Weapons Convention to equally intense scrutiny. The Senate debate is likely to reflect an argument advanced by former Pentagon official Frank Gaffney that it is impossible to verify a chemical weapons treaty.

Nonetheless, an influential nucleus of Senate treaty supporters has begun to take shape. In 1984, Sen. William Cohen (R-Maine) and Sen. Joseph Biden (D-Del.) gathered 41 cosponsors on both sides of the aisle for a resolution endorsing the Geneva negotiations. The resolution was turned into a Senate amendment, adopted by voice vote in 1985, supporting the talks and urging the United States and the Soviet Union to resume bilateral discussions on a chemical weapons ban. In 1988, Sen. George Mitchell (D-Maine)—later elected majority leader—introduced a resolution condemning Iraqi use of chemical weapons and endorsing the Geneva negotiations. It was supported 91-0.

In June 1989, Mitchell, Cohen, Biden, Mark Hatfield (R-Ore.), David Pryor (D-Ark.), and Nancy Kassebaum (R-Kans.) sent Bush a letter signed by 75 senators offering their "strong support" for his "personal commitment to ridding the world of chemical weapons." The letter went on: "It is clear to us that a total, verifiable, international treaty banning the production and stockpiling of all chemical weapons ultimately will be the most effective way of addressing this [proliferation] threat."

Of course, these strong but general statements of support do not guarantee the required two-thirds vote in the Senate. The traditional anti-arms control faction—led by Jesse Helms (R-N.C.) and Malcolm Wallop (R-Wyo.)—is likely to oppose a chemical weapons agreement just as it has opposed nuclear agreements. Ultimately, the president will have to make a strong case on behalf of the treaty, particularly that aspect of it that will most worry the Right: verification.

The president helped his cause at the United Nations in September 1989, when he declared that verification of a chemical weapons ban was possible: "We know that monitoring a total ban on chemical weapons will be a challenge. But the knowledge we've gained from our recent arms control experience and our accelerating research in this area makes me believe that we can achieve the level of verification that gives us confidence to go forward with the ban."

The chemical industry's support of the projected treaty will also be an important boost during Senate consideration. It was largely because of industry opposition that the Senate delayed ratification of the 1925 Geneva Protocol until 1975. In October 1987, the board of directors of the American Chemical Manufacturers Association endorsed the ban on chemical weapons. Since then, CMA representatives have offered technical advice and support to the U.S. negotiating team.

One more factor in the convention's favor: the Senate has never been enthusiastic about funding new U.S. production of chemical weapons. During the Reagan administration, there were three separate tie votes on whether to approve production. Even then, the White House had to lobby hard for weapons production as a bargaining chip for securing a chemical treaty in Geneva.—*John Isaacs* ■

ical bomb, and a chemical warhead for missiles. And while the United States was pressuring the West German government to block its corporations from helping Libya, Iraq, and other countries develop chemical weapons, the Pentagon was considering legal action to compel two chemical companies to sell thionyl chloride, an ingredient needed to make poison gas, to the U.S. Army. One of these companies, ironically enough, was Mobay Corp., a U.S.-based subsidiary of Bayer A.G., a West German chemical concern.

Equally unproductive is the lack of U.S. leadership at the negotiating table. For a year and a half, the Bush administration has—through a lack of either organization or enthusiasm—failed to provide its Geneva representatives with an adequate set of negotiating in-

structions. Such instructions would give the U.S. delegation the latitude to put forward positions on unresolved issues. For example, although the United States first introduced the concept of challenge inspections in 1984, the Geneva negotiators have yet to reach final agreement on how to carry out such inspections, in part because the U.S. team has been unable to sign off on the language.

A Convention on the Horizon?

IN a sign that the administration may be pulling its negotiating act together. President Bush reached an agreement with President Gorbachev at the June 1990 summit to destroy the bulk of U.S. and Soviet

*Bush and Gorbachev
agreed at the June
1990 summit to
destroy the bulk
of U.S. and Soviet
chemical weapons.*



chemical stockpiles. Each country agreed to reduce its stockpile to 5,000 tons of chemicals—an 80 percent cut for the United States, a larger one for the Soviets. Perhaps more significant, the U.S. agreed to stop producing new chemical weapons after the treaty is ratified and takes effect, probably around mid-1991.

The United States will also work with the Soviet Union to devise safe and environmentally sound methods of destroying chemical weapons. And both countries agreed to on-site inspections during and after the destruction process. The two leaders set a deadline of December 31, 1990, to negotiate details of the inspection procedures. To boost the Geneva talks, Bush and Gorbachev strongly endorsed the multilateral negotiations.

President Bush deserves credit for these promising steps, as he does for helping to mobilize domestic and international support for a chemical weapons treaty. His endorsements of the convention, during the 1988 presidential campaign and in several major addresses in 1989, are a welcome change from the more lukewarm attitude of the Reagan administration. Nevertheless, the U.S. position—and likewise the Chemical Weapons Convention—is by no means out of the woods.

For one thing, the new U.S.-Soviet agreement is not necessarily a boon to the multilateral talks in Geneva. The U.S. negotiating team, rather than devoting its full attention to the issues that still block completion of an international treaty, is spending months working out the details for inspecting the destruction of weapons under the more limited agreement signed by Bush and Gorbachev. And the partial steps achieved in the U.S.-Soviet agreement could conceivably sap the political momentum behind an international convention to ban

all chemical weapons.

In advancing non-negotiable positions such as the 2 percent solution, the administration may simply be looking to improve the prospects that a convention will be ratified by the Senate. Bush may be trying to appease the more right-wing factions in his administration, much as he has done with his strong rhetoric on behalf of the Strategic Defense Initiative. The danger is that the president, riding a tremendous wave of popularity, may continue on these dual paths indefinitely.

Achieving a chemical arms control agreement will require singleness of purpose. The president will have to whip the bureaucracy into shape, and produce the compromises needed within the administration and among the 40-nation Geneva negotiating group. Moderate North Carolina Democrat Martin Lancaster, a member of the House Armed Services Committee and of the House observer team for the chemical weapons talks, told the House on March 13, 1990: "The largest impediment to arriving at a convention continues to be the lack of a forceful enough indication of our resolve to conclude the negotiations."

Postponing hard decisions and advancing positions that hinder the negotiations could mean that the opportunity to achieve an important goal will be lost forever. Given the political will, an international convention could be completed in the next year or two. But if a treaty is indefinitely postponed, and if other developing countries are tempted to follow Iraq's and Libya's lead, the world may not be able to return the chemical weapons genie to the bottle. The convention is largely in President Bush's hands. ■

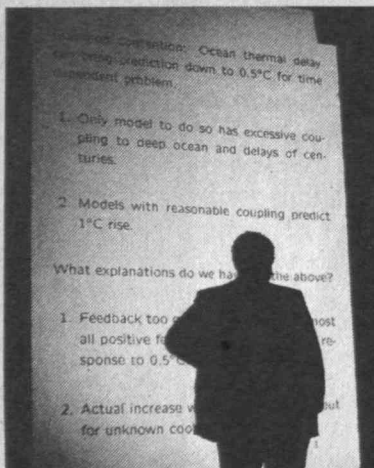
Common contention: Ocean thermal delay can bring prediction down to 0.5°C for time dependent problem.

1. Only model to do so has excessive coupling to deep ocean and delays of centuries.
2. Models with reasonable coupling predict 1°C rise.

What explanations do we have for the above?

1. Feedback too strong. Most all positive feedbacks. Response to 0.5°C .
2. Actual increase was about for unknown cooling.

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COVER

It takes a large projection to get the message to the back rows of Kresge Auditorium, and that's just what was available for the speakers at the Technology Day debate about the prospect of global warming. Article begins on page MIT 16. Photo by Barry Hetherington.



LETTERS

READER RESPONDS TO READER

A recent letter, "Ongoing Issue: Admissions" (*July, page MIT 2*), is a good example of exactly why we need a commitment to affirmative action in admissions selection. While acknowledging the benefits of diversity, Mr. Copsey does not seem to realize the extent of changes in our society. Women now comprise over half of all U.S. college students. By the year 2000, half of the U.S. population will be comprised of non-European ethnic and racial minorities. Mr. Copsey's statement that this diversity need only be represented in state-supported schools is unrealistic. MIT has seen the future and is preparing to reflect this diversity among the excellent students it admits.

The suggestion that admissions be proportional to the percentage of women and minorities "among the MIT faculty, national academies of science and engineering, and winners of Nobel Prizes and National Medals of Science," is dangerously regressive. Until very recently women and minorities have lacked encouragement and opportunities in science and engineering, and they exist in very small numbers at higher levels of academia. If women and minorities study at MIT in such a tiny proportion, how will significant numbers of these groups be able to become faculty members and Nobel Prize winners?

The implication that groups contributing large amounts to the Alumni Fund should be admitted in greater numbers is inappropriate for a non-profit institution committed to a primary goal of educational and scientific excellence. It is also another way of predicting the future from irrelevant data. Women and minorities may contribute less simply because they earn less than their white male counterparts. They also often feel alienated by the higher educational environment, and may contribute less because they have fewer positive associations with the Institute. As these groups gain economic power and feel more welcome in a diverse community, their support may rise.

Mr. Copsey asks, "With respect to society in general, should MIT be more of a window or a mirror?" Most of us agree that MIT should not be merely a mirror, but a window on the future, leading our

society. Realistically, maintaining excellence and also embracing diversity will be a challenge for MIT. It is a task that will require creativity and institutional support, but it is one that will make MIT a model for higher education in the 21st century.

NANCY D. PETERSON, '86
Boston, Mass.

GOD AND KNEES

I would like to correct some possible misinterpretations related to a description of my research in "The Care and Feeding of Hybrid Health Research" by Tom Ehrenfeld (*April, page MIT 17*). The statement "One of the sticking points in any defense of God is explaining how She could have allowed such a poor design as the human knee" not only does not represent my opinion whatsoever but is ludicrous on the face of it. Most engineers would consider a maintenance-free bearing that supports cyclic loads of more than 500 pounds and typically operates more than 50 million cycles without failure as a reasonably good design. Perhaps the author should get on his knees and think about it.

ROBERT FIJAN, SM '85
Graduate Student,
Department of
Mechanical Engineering

PUZZLE COMMENTS COMING

Editor's note: We have received a number of letters in response to our decision to discontinue "Puzzle Corner" in order to make more room for news about MIT. Thanks to all who took the time to write or call. We are in the process of re-evaluating the situation in light of your comments, and we will print a selection of the letters in the November/December issue.

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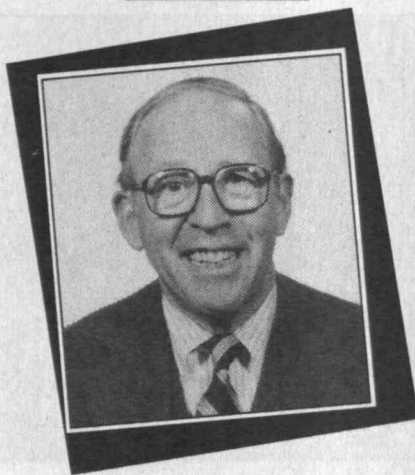
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Killian Award to Büchi

George Büchi, the Camille and Henry Dreyfus Professor of Chemistry at MIT, has been named the 1990-91 Killian Award Lecturer. Established in 1971 as a tribute to the late MIT president, the James R. Killian, Jr. Faculty Achievement Award is the highest honor bestowed by the MIT faculty upon its own. The award, which recognizes extraordinary professional accomplishment as well as service to the Institute, carries with it an \$8,000 honorarium and the opportunity to deliver two lectures in the spring term of the award year.

Büchi's citation credited him with contributions in "photochemistry, natural products, and molecular toxicology, which comprise the cornerstones of these diverse areas of organic chemistry. . . . His pioneering work on light-

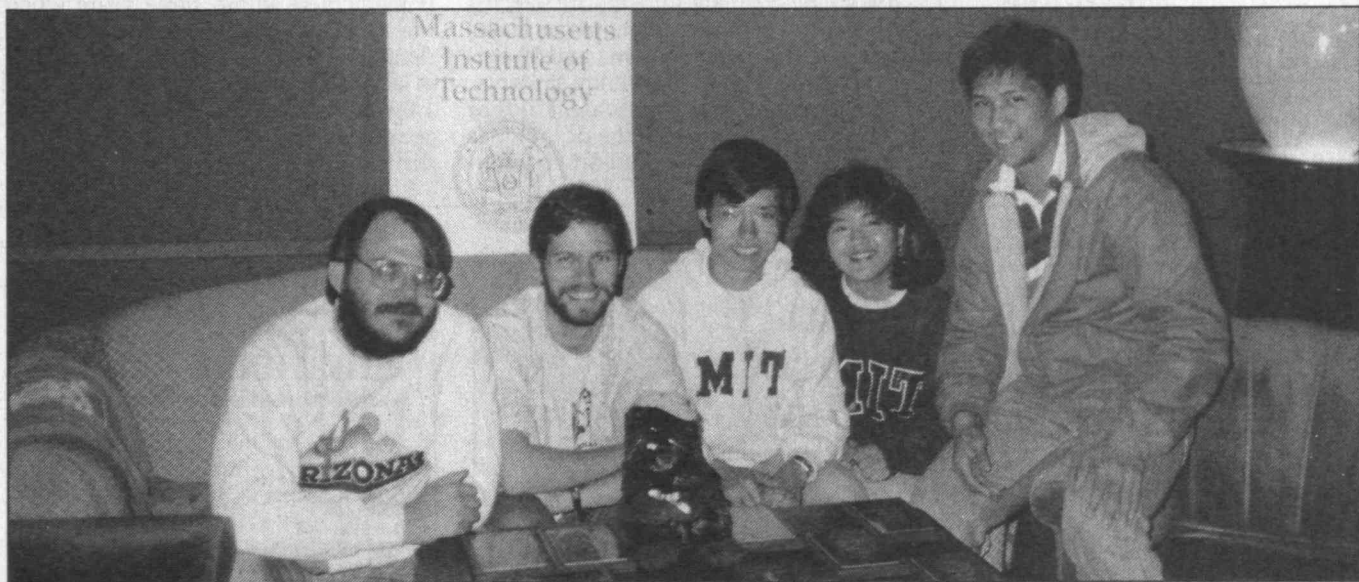


catalyzed organic reactions in the early 1950s opened up an area of investigation that has yielded insight into the relationships between electronic structure of molecules and chemical reactivity. Modern organic photochemistry can be traced to Büchi's pathmaking work at MIT."

A native of Baden, Switzerland, Büchi

received a DSc from the Eidgenössische Technische Hochschule in Zurich in 1947 and came to MIT in 1951. His many honors include two national awards from the American Chemical Society and the Order of the Rising Sun, Gold Rays with Neck Ribbon awarded by the Japanese government in 1986 for promoting mutual understanding and friendship through Büchi's teaching and guidance of Japanese postdoctoral associates.

The Killian committee's citation quoted one of his colleagues as saying, "Büchi is one of the best scientists at MIT, and one of the most human." It concluded, "George H. Büchi, MIT faculty member for nearly 40 years, has set an unprecedented standard in organic chemistry. His contributions in research and education have added to the quality of life globally, and his colleagues and students have derived benefit from his wisdom, dedication to excellence, and friendship." ■



For a bunch of specialists, MIT did downright OK in the ultimate college-level generalists' competition. The team fielded by the Institute came in second—by a fraction of a second—in the national College Bowl championship held at the University of Minnesota in April. MIT also made it to the finals in 1988,

when it came in eighth. The University of Chicago got to the buzzer faster on a question about two records Joe Montana broke in Super Bowl XXIV.

From left: Graduate students Jim Bales (from the Physics Department) and Chip Hunter (team captain, from the Sloan School) were

subsequently chosen for the all-star team by players and coaches at the end of the tournament. The other team members were (from center) James Sarvis, '93, Jane Yu, '92, and alternate Henry Chung, '93. All except Bales will be eligible next year; he has participated for the maximum six years at the college level.

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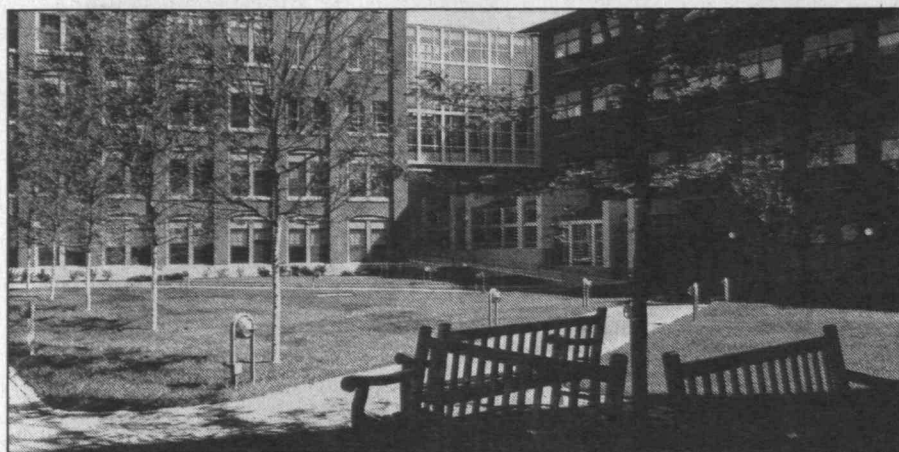
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Grad Apartments for 190 Open

The first new housing at MIT since 1982 opened in June for graduate students. A renovated building at 143 Albany Street has been converted into apartments ranging in size from efficiencies to four-bedroom units. The 190 single graduate students are selected by lottery, with 50 percent of the leases going to incoming students and 50 percent of the leases to continuing students.

Under the new graduate student housing policy, most of the dormitories for single students will hold two lotter-

ies, with the leases divided up approximately as they are for 143 Albany Street. (The exception is Tang Hall, in which all but 10 beds will be reserved for incoming students.) At the end of their first year, grad students will join the second lottery for renewable leases. Married student housing will have two-year residencies, with no extensions or tenure after two years. This plan will be fully implemented within three years when the current (and grandfathered) residents of graduate housing move out. All in all, MIT will provide approximately 1,060 beds for single students and 406 apartments for married graduate students. ■

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ALUM. NEWS

GREETINGS TO THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY
ALUMNI ASSOCIATION.

Washington, D. C.
June 11, 1927.

Charles A. Lindbergh

This rare Lindbergh autograph led aviation historian Jack Carpenter to reconstruct events surrounding the first

documented use of fax technology at an almost-forgotten MIT dinner in New York on June 11, 1927.

MIT a Player in Fax History

Intercity—even intercontinental—fax transmissions in the 1920s? Absolutely true, although the vocabulary wasn't yet developed. And now, when no office dares to be without a fax machine, you'd think the historic occasion when this then-revolutionary technology was first demonstrated would be well remembered. Not so.

It happened at a formal dinner at New York's Waldorf Astoria on June 11, 1927, the culmination of a two-day MIT alumni gathering that was billed as the ninth assembly of the Technology Clubs Associated. Chief goals for the assembly—one of which has sunk at least as far into oblivion as the first fax—were a "better understanding between MIT authorities and the alumni" and a 25-story "National Technology Center" to house MIT representatives in Manhattan.

The facsimile messages were transmitted to the 1,100 alumni at the banquet from Hawaii, London, and

Washington by what was then called "radio picture" or "photoradio." Dinner guests were also treated to "talking movies" of campus and classroom scenes in Cambridge—a pioneering demonstration of motion pictures with synchronized sound. This extravaganza of new communications technology was staged for MIT by the Radio Corporation of America (RCA) and Fox-Case Film Co.—a tribute to the Institute for "the important part it has played in developing the radio picture and the talking film," according to the report in the *New York Times*.

The photoradio messages were reproduced on three-foot rolls of paper that emerged from receivers in the ballroom as diners watched. One came in long-hand from Horace Johnson, '01, then president of the Technology Club of Hawaii; one was from Sir Oliver Lodge in London; and the third—the most notable—brought greetings from Colonel Charles A. Lindbergh, who only that morning had arrived in Washington after his pioneering flight to Paris less than a month before.

The *Times* credited photoradio to Army Captain Richard H. Ranger, '11. At the transmitter, said the *Times*, the image to be sent "is reduced to radio signals—dots and dashes for black, pauses for white" by a new RCA-developed device called a photocell. At the receiver, these signals activated a hot-air gun aimed at a slowly advancing roll of nickel-treated paper. "On application of heat," wrote the *Times*, "the nickel paper turns from white to a handsome sepia."

The show was tough competition for keynote speaker Thomas C. Desmond, '09, president of the Technology Clubs Associated, who proposed a new structure near Grand Central Terminal to house MIT public relations, fund-raising, admissions, and alumni events in Manhattan. This \$3 million vision apparently died a quick death.

The story of this event, now virtually unknown on the MIT campus, came to light last spring when aviation history buff Jack Carpenter acquired the original copy of the message, which bears Lindbergh's signature.

Carpenter has a theory about how it probably happened: among those present to greet Lindbergh and witness his receiving the Distinguished Flying Cross from President Calvin Coolidge on the morning of June 11 was Edward P. Warner, '17. Warner had headed MIT's course in aeronautical engineering before becoming assistant secretary of the Navy for aeronautics in 1926. Carpenter assumes that it was Warner who caught Lindbergh's attention long enough during a hectic day in Washington to capture the autograph on the brief greeting.

Lindbergh autographs are rare, says Carpenter, and this one is for sale (Drawer F, Carlisle, Mass. 01741).

—John Mattill ■

Rich Lecture Fare Offered to Boston Area Grads

Boston area alumni/ae are offered rich fare during the 1990-91 lecture season: the "Windows on MIT" series will focus on nine faculty members who are MacArthur Prize Fellows, and the Boston Seminar Series considers six pivotal contemporary issues under the heading "History in the Making."

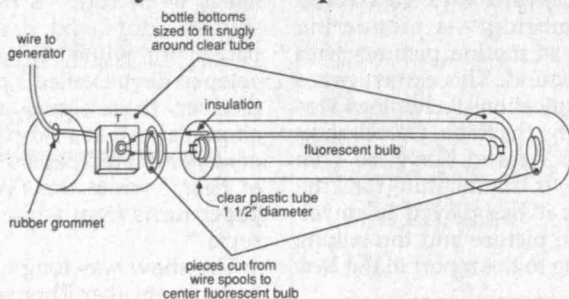
Everyone who reads a newspaper—or the August/September *Technology Review* (pages MIT 19-24)—has by now

heard of the MacArthur Fellowships, individual, five-year grants of between \$30,000 and \$75,000 per year that are designed to foster creativity in the arts, sciences, and community affairs. Of the 12 members of the MIT faculty who have received MacArthur Fellowships, 9 are still teaching at the Institute, and each will give a lecture in the series.

The Windows series opens on Oct. 15 with Mark Wrigton, head of the Chemistry Department, speaking on approaches to molecular electronics; on Nov. 19 Alar Toomre, '57, professor of applied mathematics, will present a lecture and film on interacting galaxies; and Professor of Economics and Management Michael Piore will speak on the

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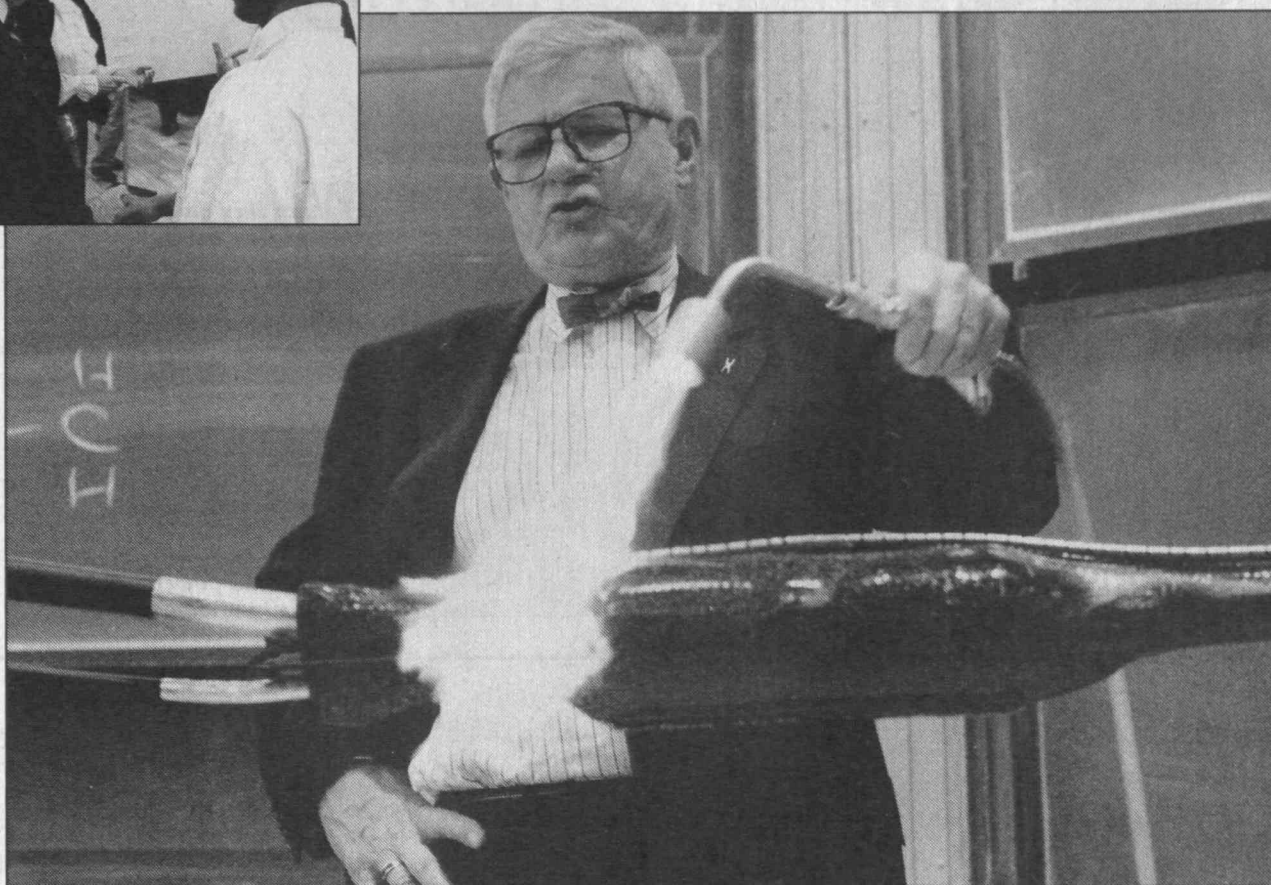
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In late April the MIT Chemistry Department took advantage of the American Chemical Society's national meeting held in Boston to assemble more than 80 alumni/ae for a reunion and seminar. The seminar, en-

titled "The Role of Chemistry in Entrepreneurship," was presented by Paul Cook, '47, founder and chairman of Raychem Corp. The event served also to announce the establishment of the Paul and Marcia

Cook Fund for Innovation in Chemistry.

During the seminar, Cook (above) gave a scorching demonstration of one of his company's products—a weather-tight, shrink-wrapped cover for cable

splices. At the poster session that followed, former Exxon chairman J. Kenneth Jamieson, '31 (upper left), is shown talking with Assistant Professor of Chemistry Philip Phillips.

compatibility of American individualism and economic competitiveness on Dec. 13.

The New Year will open on Jan. 15 with a lecture on the music of tomorrow by John Harbison, Class of 1949 Professor of Music; on Feb. 19 Richard Mulligan, '76, associate professor of biology and researcher at the Whitehead Institute, will speak on gene therapy; and Charles Sabel, professor of social science, will speak on corporate reorganization and the changing work experience on March 18.

Professor Heather Lechtman, director of the Center for Materials Research in Archaeology and Ethnology, will speak on the materials science of material culture on April 16; Eric Lander, also an associate professor of biology and researcher at the Whitehead Institute, will speak on mapping the human genome on May 6; and the series will end on May

30, when David Page, assistant professor of biology and researcher at Whitehead, will speak on genetic reductionism.

The Boston Seminar Series opens on November 5, when William Quandt, a senior fellow at The Brookings Institution, will speak on "The Middle East After the Cold War"; on Dec. 3, Hans Decker, president of Siemens Corp., will present "A German Industrialist's View of EC 92 and German Unification."

"Adjusting to a Peace Economy: Challenges for the United States and New England" will be the Jan. 7 topic of Yolanda Henderson, an economist at the Federal Reserve Bank of Boston; she will be followed on Feb. 5 by Graham Allison, the Douglas Dillon Professor of Government and former dean of Harvard's Kennedy School of Government, speaking on "Revolutions in the Soviet Empire: Beyond the Cold War."

Another perspective on "1992 and German Unification: Complementary or in Conflict?" will be offered on March 4 by William Griffith, the Ford Professor of Political Science at MIT and former senior advisor to the U.S. ambassador in Bonn; and the series will wind up on April 1, when Rita Klimova, the Czechoslovakian ambassador to the United States speaks on "The Outlook for Eastern Europe."

The Boston Seminar Series is organized by the Alumni/ae Association, and the cost for the six dinner/lectures at the MIT Faculty Club is \$108. Information is available from Susan Downey, (617) 253-8233. The nine events in the "Windows on MIT" dinner/lecture series will be held at Walker Memorial, and the cost is \$160 for members of the MIT Club of Boston and guests and \$190 for non-members. Information is available from Jill Burger at (617) 253-8245. ■



When they had to face MIT in "Toy League" summer softball in New York City, Brown alumni wimped out — only five players dared show up. Undaunted, the MIT team, fueled by a serious sandwich, simply allocated enough players to help Brown make a team, and the game went on. Alas, a few weeks later, MIT alumni/ae were defeated by that athletic powerhouse, University of Chicago.

Pulling Out All the Stops for Family Weekend

In one morning, guests at MIT's second annual Family Weekend, Oct. 19-20, can go from a lecture by Jay Keyser to one by Walter Lewin to one by Harry West, PhD '86, which could be enough to blow mental circuits in the most intrepid intellectual tourist.

For those who are unfamiliar with Keyser, who is associate provost, a linguistics scholar, and all-purpose campus idea circulator; with Lewin, who is producer, director, and star of the most exuberant and illuminating versions of 8.01 and 8.02 (first-year physics); and West, the youthful mechanical engineer who blew everyone out of the water by carrying on the 2.70 design competition—both here and in Japan—in a style worthy of Woodie Flowers, PhD '73, we can only say you have to see and hear them for yourselves.

Winning robots, famous hacks, the work of the Plasma Fusion Center, high-definition television, preparing for the manned mission to Mars—all these and more will be on the program. Expect that it will be standing room only for the presentation of "A User's Guide to the Brain" by Associate Professor of Psychology Jeremy Wolfe, PhD '81.

Some 500 students and 1300 of their relatives and friends reported having a wonderful time at the first Family Weekend in 1989, despite one day of drenching rain, thanks to the efforts of

hundreds of members of the Institute community. The occasion offered families their first major opportunity to connect with their students' MIT world between Orientation and Commencement. With a little cooperation from the notoriously fickle New England autumn weather, this year could be a blockbuster.

Family Weekend is organized by the Association of MIT Alumni and Alumnae, and registration forms were sent to the home addresses of all MIT undergraduates. Families that did not receive a form can contact Parents' Program Manager Marcia Hartley at (617)253-0743. ■

Corporation Elects 12

Three life members and nine term members were elected to the MIT Corporation at its June 4 meeting. The new life members are: Colby Chandler, SM '63, director and former chairman and CEO of Eastman Kodak Co.; David Saxon, '41, who will retire as chairman of the Corporation when Paul Gray, '54, succeeds him in mid-October; and Emily Wade, '45, a trustee of the Manomet Bird Observatory in Manomet, Mass.

Elected to five-year terms, in some cases a second term, are: Samuel Bodman, ScD '65, chairman and CEO of Cabot Corp., Boston; Denis Bovin, '69, managing director of Salomon Brothers, Inc., New York; Jerome Grossman, '61, chairman and CEO of New England

Medical Center; and John Hennessy, president and CEO of CS First Boston, Inc., New York.

Also elected to five-year terms are: George Keller, '48, retired chairman and CEO of Chevron Corp., San Francisco; James Levitan, '45, partner in Skadden, Arps, Slate, Meagher & Flom, New York; Edward Linde, '62, president, trustee, and principal of Boston Properties, Boston; Bernard Loyd, '85, and Phd '90, representative of recent graduates; and Harris Weinstein, '56, chief counsel, Office of Thrift Supervision, Department of the Treasury, Washington, D.C.

In addition, Christian Matthew, '43, retired founder and executive vice-president of St. Mary's Foundation, San Francisco, is now an *ex officio* member of the Corporation by virtue of his selection as president of the Alumni/ae Association for 1990-91. Jerome Grossman, George Keller, and Harris Weinstein are all Alumni/ae Association nominees to the Corporation.

As of July 1, the Corporation is composed of 75 leaders in education, science, engineering, and industry. Of the 75, 25 are life members. There are also 22 life members emeriti, who participate in meetings but do not vote. ■

October 19-21
Family Weekend
Contact: Marcia Hartley
(617)253-0743

October 12-13
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ProNet information packages were mailed in May. If you have not received one, please write to MIT ProNet Registration Department, MIT Alumni Association, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139.

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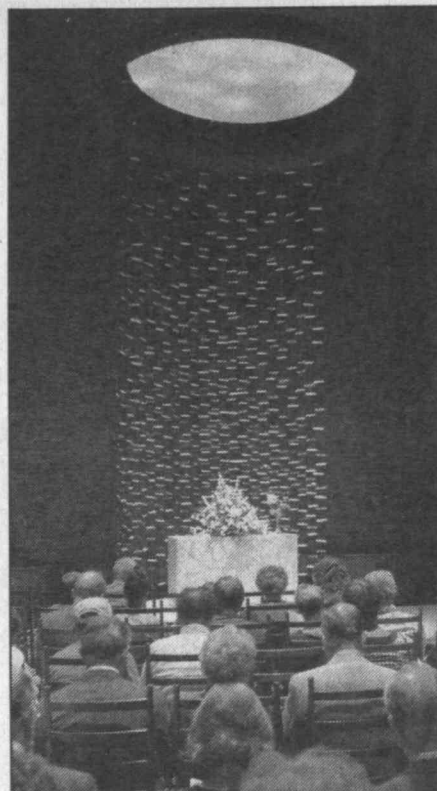
Olympus, Bedlam, and Reunion Gifts

Maybe MIT had something to do with his "very satisfying professional career," mused Robert V. Gould, '40, in his class's 50th Reunion book last spring. No, he quickly wrote, "scratch that 'maybe!'"

Andrew Tanenbaum, '65, recalling a recent invitation to deliver a seminar at MIT on his research on computer operating systems, found he was still awed by the place. "Somehow MIT is different," Tannenbaum wrote for his 25th Reunion class book. "It is like being invited to drop in at Mount Olympus and have tea with the gods."

Scores of other alumni and alumnae have similar things to say about their Institute experiences, and it was enthusiasm like this that brought more than 1,300 alumni/ae and guests to MIT June 9-10, the largest Technology Day audience in recent years.

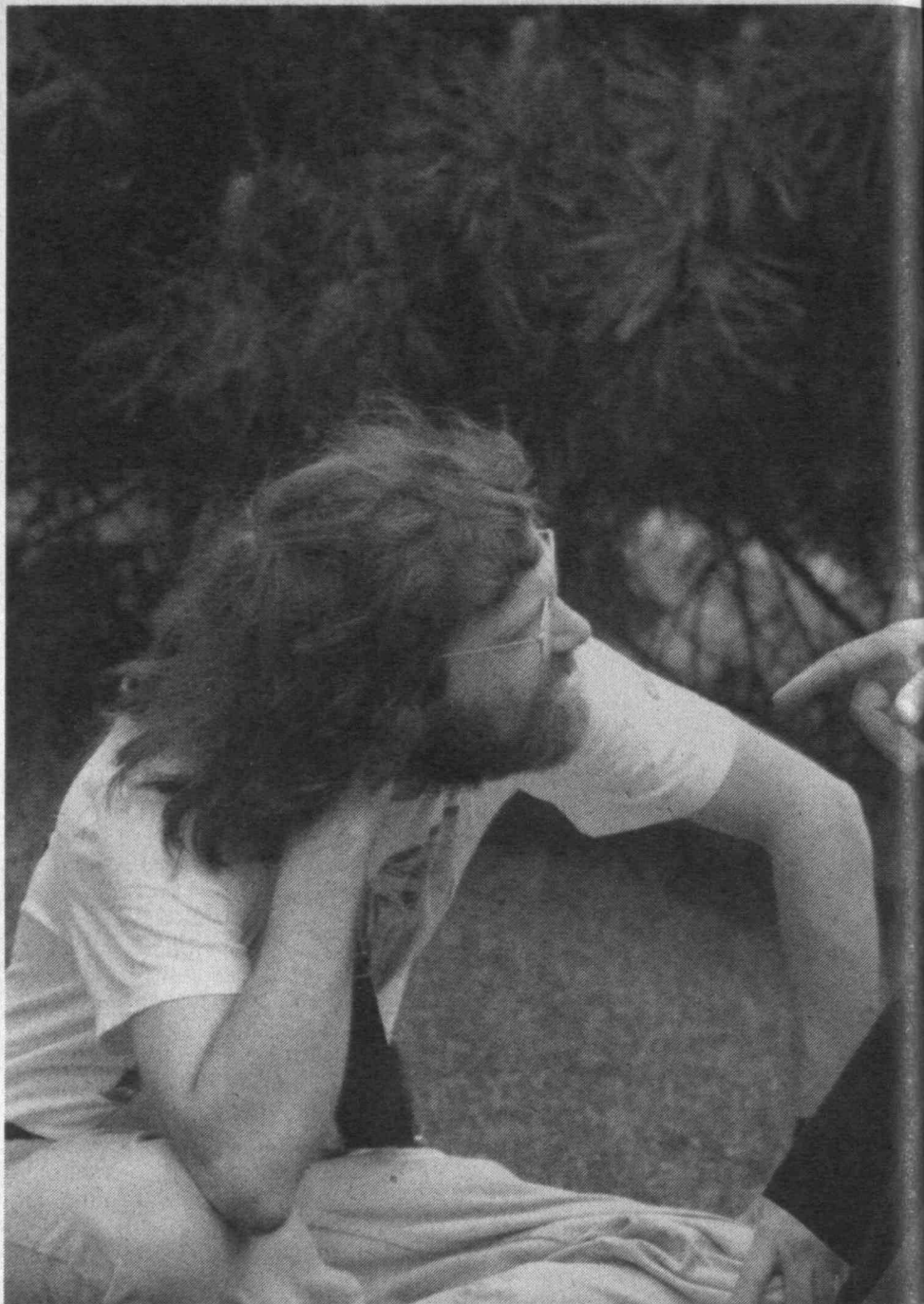
In addition to new memories that enliven old ones, the visitors took home new understanding of one of our most compelling and far-reaching environmental problems—global warming and possible subsequent climate change—thanks to a brilliantly staged debate marking the centennial of the Department of Earth, Atmospheric and Planetary Sciences (see page MIT 16). And they left behind them tangible evidence of their loyalty and appreciation: reunion gifts totalling \$15.5 million.



For John J. Brown, president of the Class of '32, and many other alumni/ae, the first thing to do when they arrive for reunions is to check the attendance roster to see which friends are registered. Also important for many is attending the Memorial Service in the MIT Chapel to commemorate cherished classmates who have died. But the occasions that give reunions their definitive character are parties like the Mexican Fiesta for the Class of '85, scene of Muffy Hess's spirited attack on a piñata. With more than 100 alumni/ae on hand, '85 held the largest fifth reunion in memory.



Clockwise from top left: Chris Matthew, '43, newly installed as the 96th president of the Association of MIT Alumni and Alumnae, enjoyed one of the President's reunion receptions with his wife Marjorie and daughter Joyce. A generational difference in dress code and some 50 years difference in age didn't keep Jack Lurie, '24, and Guy Harris, '75, from enjoying a meeting of the minds. Bob Mann, president of the Class of '50 since 1949, and Dorothy Bernitt were among the members of the 40th reunion group that enjoyed a perfect dinner at the Museum of Science, thanks in part to the good offices of classmate William Murphy (not in photo), the museum's associate director. The floor of Symphony Hall just prior to a Pops concert may be one of the noisiest places to try to have a conversation, but everyone was having such a good time, they didn't seem to care. Richard Bator, '65, and wife Patricia are but two of the hundreds of reunion guests who have discovered the pleasures of the garden of the President's House.



The oldest alumnus at the Technology Day luncheon was Robert A. Warren, '15, of Weston, Mass., celebrating the 75th anniversary of his graduation in electrical engineering. Four members of the Class of 1920 were present, including the indomitable Harold Bugbee: he has been secretary of his class since graduation and was president of the Alumni/ae Association in 1946-47, 43 years ago. Honors for the longest distance traveled to attend the day's events were shared by Ching T. Yang, '30, of Shanghai and Pradip D. Burman, '65, of New Delhi.

There were honorary Alumni/ae Association memberships for four nonalumni who qualify among "the truest and closest members of the MIT family," in the words of outgoing Association President Harris Weinstein, '56: George W. Thorn, a long-time member of the MIT Corporation; Margaret McDermott, donor of a major undergraduate scholarship fund; Professor Robert M. Solow, guest speaker of choice for countless alumni meetings; and Robert D. Blake, senior regional director of the Association.

The 50-year Class of 1940 had the longest reunion, stretching from June 4, when its red-coated marchers were applauded by the Commencement audience in Killian Court, to June 8. Its members had mixed reactions to all the campus changes. His visit was "a revelation," said Harold Spaans of Willow Street, Pa. But venturing into Walker Memorial gave Angelo Ricciardelli of Charlottesville, Va., a real pause: the lounge where in the 1930s the faculty went for rest and relaxation is now "bedlam," he said—"a graduate-student beer joint."

Their yearbook reveals that the Class of 1940 is typical in its nonconformities. They've won all the usual honors and perks—vice-presidencies, presidencies, chairmanships, and gold braid in the military. But consider this: William R. Stern finished the Boston Marathon in 1986 and the Mount Washington Road Race in 1987; and John Vanderpoel figures his lifetime bicycle mileage at 250,000—mostly since he retired less than a decade ago.

The Class of 1940 shone as well in the category of giving money—a reunion gift of more than \$5.9 million





A Phi Kappa Theta "photo-op" at the traditional President's House reception for the 25th Reunion Class. From right: Leslie and Tom Jernick, Sandee and Albert Tervalon, Bettie and Richard Morgen, Mary Lou and Peter Heinemann, and Bob Szpila and Yvonne Price.

Near right: when the Reunion Children's Program scheduled a session in the Mac Lab run by MIT Information Services, the sons of (from right) George Meyers III, '60, Bill Brody, '65, and Walter Schroeder, '70 were just three of their very happy customers. Demonstrating their chops on the dance floor for fellow members of the Class of '80 were Carey Rappaport and Debra Utiko. Far right, top: the action was so fast in the game of



Telephone Tag (you saw it here first!) at the Saturday barbeque that taking names was hopeless. Far right, bottom: Members of the Classes of '75, '80, and '85 had time to get into serious bubbles before the dining and dancing started at their joint party at Boston's Children's Museum.



contributed by 75 percent of the class members, according to gift chair Tyler Marcy—"a new modern record," he said. Furthermore, said Marcy, his classmates have committed another \$1.3 million in bequests to MIT.

Other major presentations at the Technology Day luncheon:

■ From the Class of 1965, a 25th-reunion gift of \$2.24 million in which 70 percent of the class participated, said gift chair William Brody.

■ A 40th-reunion gift of \$4.6 million announced by the Class of 1950's chairman Henry Sharp, Jr. Of that, just over \$1 million was for the class's scholarship fund, already the largest such fund at MIT, Sharp said.

Giving by young reunion classes was impressive, as announced by Weinstein: \$87,221 from the Class of 1975; \$50,675 from the Class of 1980; more than \$25,000 from the Class of 1985; and \$8,000 from the Class of 1990. Weinstein also announced that the 60-year Class of 1930 raised \$836,593, and \$1.77 million came to MIT from the 65-year Class of 1925.

Weinstein also reported an estimate of the 1990 Alumni/ae Fund total—\$16 million from 29,000 donors expected by the time the books closed on July 1. Both figures would be record highs, he said, and Alumni/ae Fund donors did so well that essentially all of the \$1 million challenge fund offered last fall by David Koch, '62, would come to MIT.

Responding, President Paul E. Gray, '54, called this "truly splendid support." It was the last time, he said, that he would stand before a Technology Day luncheon, the largest annual gathering of the alumni/ae family, and he had a special message: The Institute "is truly blessed" by its alumni and alumnae. For him and for his wife Priscilla, whom he called to the podium to share the special moment, the last 10 years have brought "enormous rewards. . . . You learn something new every day," he said, and "you get to know so many wonderful people.

"Your abiding confidence and support have made all the difference," Gray said in response to the standing ovation. □



Paul Gray called Priscilla to the podium to share with him the applause of assembled alumni/ae on this, his last Technology Day as president, and that's when everybody stood up and really clapped.



Nobody knows better than reunion-goers that Paul and Priscilla have been more than just president-plus-wife to MIT; they've been a presidential team for 10 years. The same luncheon saw Class of '50 reunion gift chairman Henry Sharp (center left) and Class of '40 reunion gift chairman Tyler Marcy announce their classes' tremendous support for MIT. (Bottom) William Brody, gift chairman for the 25th Reunion Class, was one of the speakers when the Class of '65 announced that one element of its gift is a \$260,000 unrestricted endowment fund raised in honor of former Dean of Residences Fred Facett. The announcement was made in the room in the Student Center where a rededicated portrait of Facett now hangs. Dean Facett initiated the housemaster and tutor system, and "provided a lot of the warmth on campus" during his tenure, Brody said.



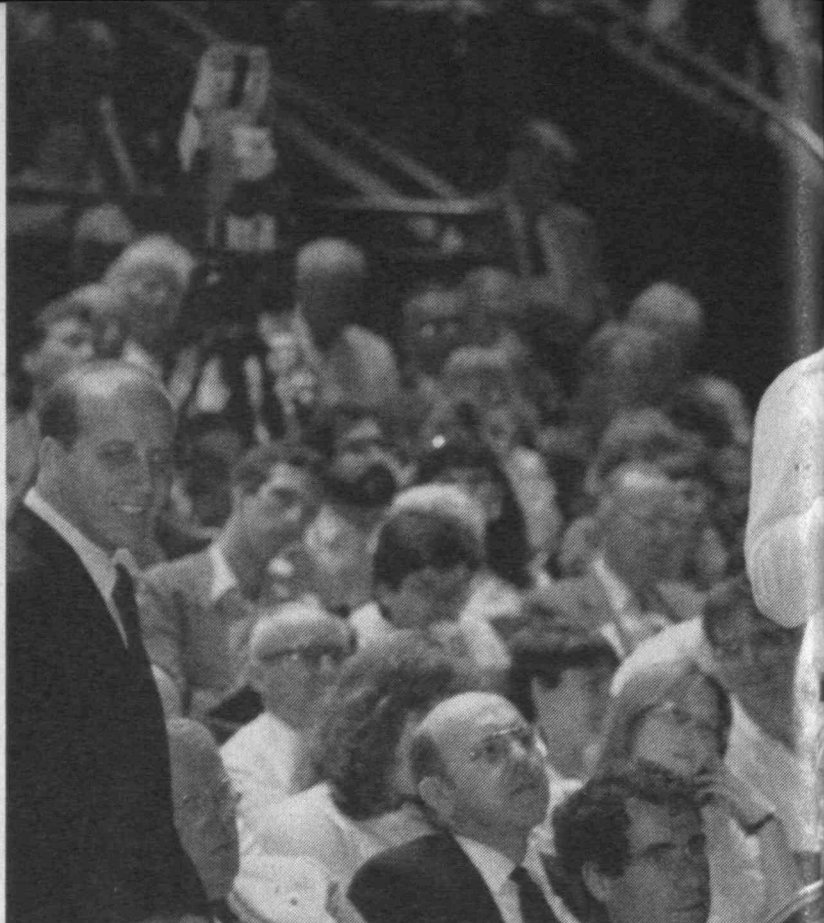
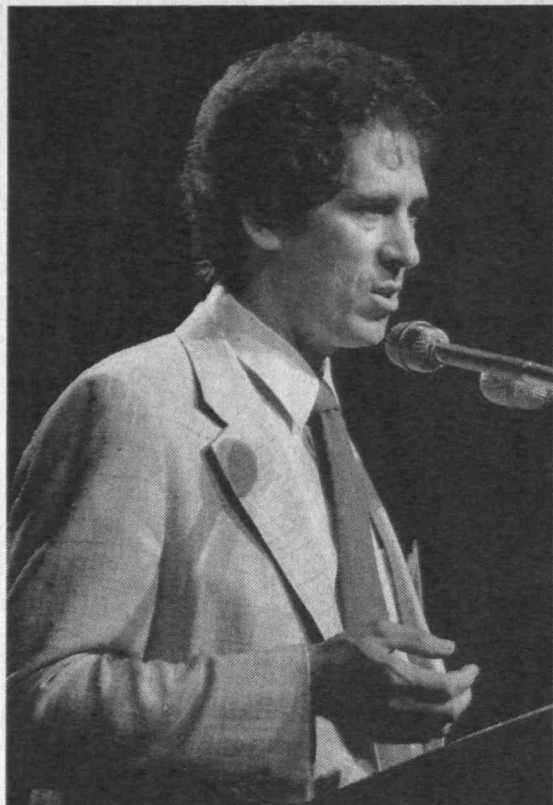
From Geology to EAPS in 100 Years

The first major milestone in the study of earth sciences at MIT came in 1890 with the establishment of the Department of Geology. Over the next 100 years, the department—currently known as Earth, Atmospheric and Planetary Sciences (EAPS)—would change its name eight times.

In roughly that same period of time, the temperature of the Earth increased by about .5 degrees centigrade. The concentration of carbon dioxide in the atmosphere grew by some 25 percent and is now rising at the rate of approximately .3 percent annually. The concentrations of other so-called "greenhouse gases" are growing even more rapidly.

On June 8th and 9th, hundreds gathered at MIT to celebrate the EAPS centennial. It was also a time to take stock of what has happened to our planet since the department's founding, and what is likely to occur in the future. High points of the occasion were the presentation of the department's first Centennial Award to Cecil Green, '23, who with his late wife Ida has been EAPS' most generous benefactor, and a Technology Day debate that filled Kresge Auditorium and drew

PHOTOS: MIT MUSEUM;
L. BARRY HETHERINGTON



*"Global warming
could turn out to
be less than we
predict, but it
could also turn out
to be greater.
Can we afford
to wait 20 years
to find out?"*

—SCHNEIDER



an overflow crowd to watch the event on closed-circuit TV monitors.

The debate on the morning of June 8 focused on the reliability of models that predict global warming. Stephen Schneider of the National Center for Atmospheric Research (NCAR) and MIT Professor Richard Lindzen were the key speakers.

The event couldn't have been more topical. "Anyone who has doubts about this program's timeliness should look at today's *New York Times*, noted President Paul Gray, '54, in his introductory remarks. Gray was referring to a front page story about deforestation in the tropics, and how it might exacerbate the greenhouse effect.

Acting as moderator, Professor Ronald Prinn, ScD '71, set the stage: "First, let me assure you that the greenhouse effect is a real effect," he said. Carbon dioxide, water vapor, and other greenhouse gases—such as methane, nitrous oxide, and chlorofluorocarbons—trap heat in the atmosphere and redirect some of that heat back to the ground. If the water vapor and carbon dioxide were absent from our atmosphere, Prinn remarked, the ambient temperatures over the entire globe

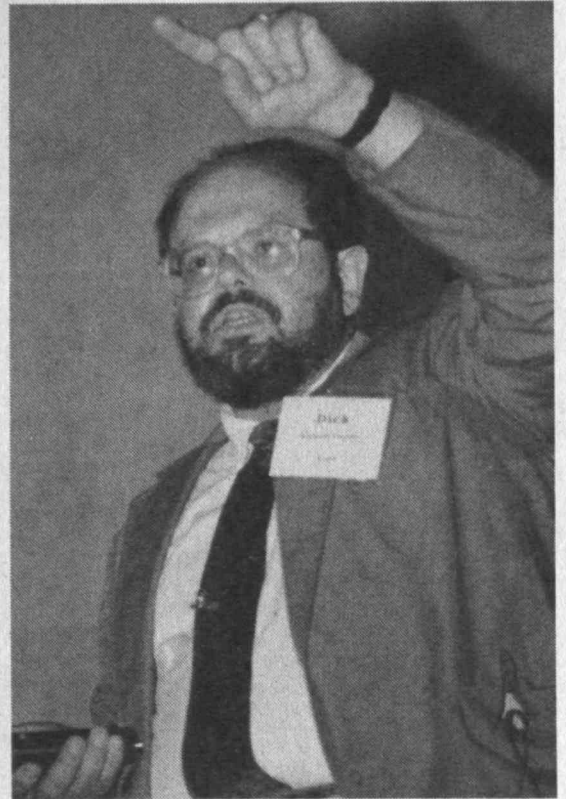
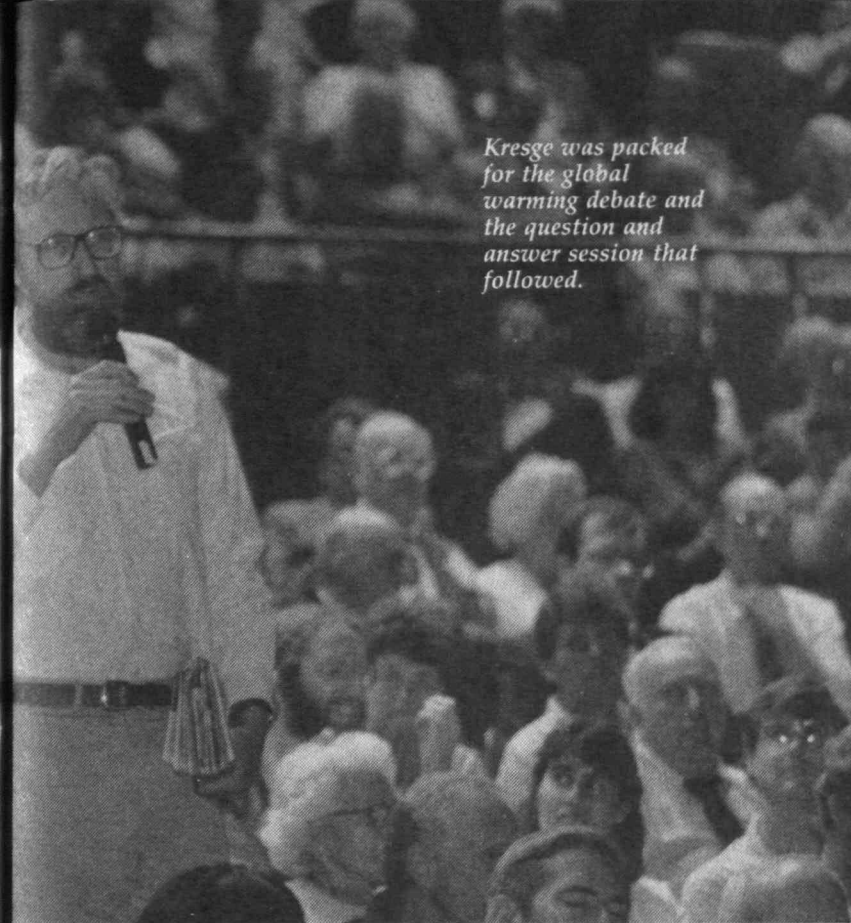
would be 33 degrees centigrade cooler than they are now. On our neighboring planet, Venus, the atmosphere is so thick with water vapor and carbon dioxide that the temperature is more than 500 degrees centigrade higher than it would be otherwise.

Prinn laid out the uncertainties of the current controversy. There is a reasonable correlation between changes in carbon dioxide levels and the rise and fall of the Earth's temperature over the last 160,000 years, he said. "But is the temperature rise due to the changes in carbon dioxide, or is the carbon dioxide rise due to the increase in temperature? We don't know yet."

Moreover, Prinn said, there is still disagreement over whether the Earth is getting warmer. To illustrate this point, he displayed a graph by James Hansen and colleagues from the Goddard Institute for Space Studies that showed the average global temperature rising; another graph produced by Kirby Hanson of the National Oceanic and Atmospheric Administration showed the temperature staying constant.

Furthermore, there is no way of

Kresge was packed for the global warming debate and the question and answer session that followed.



predicting how rapidly greenhouse gas concentrations will rise in the future, nor what impact that will have. "Most predictions are for significant global warming over the next century," Prinn said. "But are they right?" The two debaters squared off over this basic issue.

Schneider explained that the global circulation models he and others are developing offer "a surrogate way of trying to do an experiment when you don't have a lab. In this case, we do have a lab, but we live in it and breathe in it."

In his judgment, the least likely outcomes for the 21st century are "the end of the world or nothing [no temperature change]." The best estimates from computer models suggest that doubling the concentration of carbon dioxide will increase the average global temperature by 1.5 to 4.5 degrees centigrade, Schneider maintained. "A guy from the OMB [federal Office of Management and Budget] asked me, 'What's the big deal if the temperature increases by 3 degrees?' That's like moving from Boston to Washington, D.C., but forests and trees can't call National Van Lines to help them move."

On the reliability of the models,

Schneider said, "A word like 'reliable' is value-laden. People accepting the same basic facts may disagree because of semantics." In absolute terms, the models are not reliable. However, he believes that they are accurate enough to warrant taking serious action, "rather than waiting 10 or 20 years to find out if they're right or not."

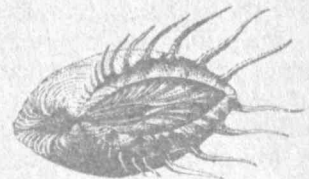
Lindzen discussed a trend that he, as a theorist, finds worrisome: "Modeling used to be considered the tool of theory. Increasingly, there's a new notion that modeling is independent of theory. . . . At places like NCAR, models are assessed by comparison with other models," rather than with hard data.

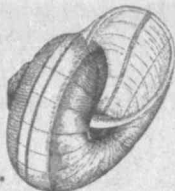
Lindzen said the reported .5-degree temperature rise over the past century may not be a result of a rise in carbon dioxide and might not even be real. He considers a .5 degree rise in the future more likely than the 1.5 to 4.5 degrees forecast by Schneider. "If we were not caught up in politics, we would have a pressing obligation to find out why the models are wrong."

In the midst of all the uncertainties, what's to be done? During his

"If we were not caught up in politics, we would have a pressing responsibility to find out why the models are wrong."

—LINDZEN





rebuttal, Schneider showed a cartoon of a doctor saying, "We have a lot more tests to go through before we can say for sure we don't know." He pointed out that "uncertainty, as a sword, has two blades." Feedback mechanisms, some of which are still unknown, may serve to increase global temperatures or to reduce them. "We could wait 20 years and find out," he said. "Is that a chance worth taking?"

Lindzen argued that in the 1970s some scientists, including Schneider, were worried about global cooling. "Back then, they asked, 'Can we afford to wait?' It's the same rhetoric we hear today with respect to global warming."

A third speaker, Professor Henry Jacoby of the MIT School of Management, said, "It's hard to imagine a more difficult set of circumstances than the debate over the global mean temperature." It will take "at least a professional lifetime" to resolve the major questions. In the meantime, Jacoby believes, at the very least "we should do the things we ought to be doing," such as energy conservation and air pollution control.

"Don't scuttle a good idea by tagging it on to global warming," Lindzen countered. "If energy conservation is a great idea, we should pursue it on its own merits. If the temperature dips 10 to 20 years from now, are you going to say energy conservation is bad?" The models will improve with further study, he added, but "they'll never produce certainty. Testing never proves a theory right; it just improves confidence."

Prinn summed up the debate by saying that "scientists are not ready to give the reliable, accurate predictions the public needs. We must accelerate research; we need more accurate models."

Following the "Great Debate," there was an EAPS open house with demonstrations on atmospheric chemistry, geology, ocean circula-



The first bachelor's degree awarded by MIT's newly formed Department of Geology in 1890 went to Dixie Lee Bryant, (front row, fourth from left) shown here with all of her fellow women students in 1888.

tion modeling, and meteorology. Alumni/ae, students, and visitors were also invited to lectures on the Antarctic ozone hole, volcanoes, earthquakes, chaos in the solar system, and—on Saturday morning—the history of the department.

Department Head Thomas Jordan noted the importance of this kind of event, especially for students. "Science these days can be a very specialized activity," he said. "Understanding the history of your field helps put in perspective what's going now and what we should be doing in the future."

The EAPS story begins, as many Institute tales do, with MIT's foun-

der, William Barton Rogers. Rogers was MIT's only geology professor from 1865 to 1870, and he saw to it that every graduate of the school gained at least some familiarity with the subject. In the first graduating class, 1868, six of thirteen students received degrees in geology.

The Geology Department, as noted, was created in 1890. It awarded its first degree a year later to a woman, Dixie Lee Bryant, which was consistent with Rogers' original vision that the Institute be a place of higher learning for members of both sexes. The first two PhDs in paleontology in the department were also granted to women.



(Two out of three current undergraduate majors are women.)

Waldemar Lindgren—a Swedish-born scientist who served as chief geologist for the U.S. Geological Survey—took over as department head in 1912. Four years later, he supervised the relocation of the department from Boston to the new Cambridge campus. He also established the cooperative arrangement whereby MIT students could take classes at Harvard and vice versa.

Lindgren's fame as an economic geologist attracted graduate students from the United States, Canada, Europe, Asia, South America, and Australia. Four of Lindgren's

graduate students went on to join the faculty of the Geology Department—among them Martin Buerger, '24, who taught here for half a century. Buerger launched his teaching career in 1925 while still a student, and officially joined the faculty in 1929. He retired in 1975.

Buerger had an insatiable curiosity about the spatial arrangements of atoms in solid matter. He made important theoretical advances in the study of crystal structures, as well as inventing the precession camera, which is still standard equipment in crystallographic laboratories. His lab at MIT was a tightly run operation strewn with infor-



A History of Names

Throughout its 100 year history, Course XII had modified its name many times to reflect its changing faculty, curriculum and research.

Geology
1890

Geology and Geodesy
1905

Geology
1912

Geology and Geological Engineering
1917

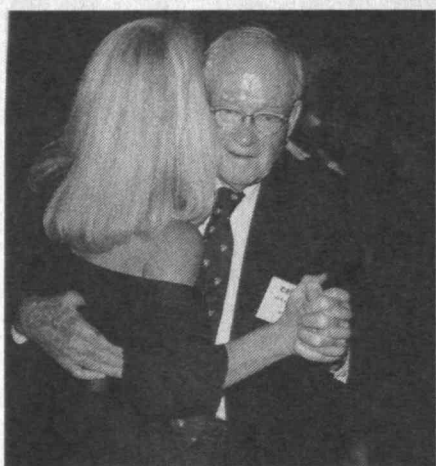
Mining, Metallurgy, and Geology
(combined with Course III)
1920

Geology
1927

Geology and Geophysics
1952

Earth and Planetary Sciences
1969

Earth, Atmospheric and
Planetary Sciences
(merged with Course XIX)
1983



EAPS' 100th anniversary celebration was great fun for one of the department's best friends, Cecil Green, shown receiving the first Centennial Award from EAPS Chairman Tom Jordan and dancing with Robin Jordan.

mational labels and subtle warnings such as: "DO NOT TOUCH THIS DIAL" and "ABSOLUTELY DO NOT OPEN THIS DOOR!"

Robert Shrock joined the faculty in 1937 and served as department head from 1949 to 1965. Shrock worked with Cecil Green to set up a summer training program for MIT students at Green's company, Geophysical Services, Inc. (GSI). (See page MIT 30 for a review of Shrock's biography of the Greens.) The success of this collaboration laid the foundation for the Greens' spectacularly generous support of the Institute, including funding for a new

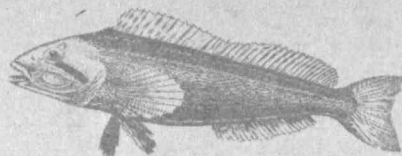
earth sciences building. ("Bob turned out to be one of the most expensive friends I've ever had" is Cecil's oft-quoted remark on the subject.)

Green had returned to the campus in the 1950s as a member of the Visiting Committee for Geology and Geophysics. "I could see that the earth sciences program had a serious ailment," Green recalled in his centennial remarks. "It was scattered in several buildings, broken up and spread around like a dog's breakfast." He and Ida resolved to unify the program within a single structure. I.M. Pei, '40, was selected as the architect for the facility, and the Cecil and Ida Green Center for Earth Sciences was officially dedicated on October 2, 1964.

At MIT, the earliest models involving climatic change were developed in the Meteorology Department, which was founded in 1928 by Swedish meteorologist Carl-Gustaf Rossby. The years 1956 to 1981, according to Professor Peter Stone, encompassed "the golden age of meteorology," when MIT's faculty dominated the field. One of those responsible for the department's elite status was Professor Edward Lorenz, ScD '48, the father of chaos theory. Jule Charney was another luminary who made pioneering advances in numerical weather prediction. Charney is considered the person most responsible for transforming weather forecasting from an art into a science. In 1983, the Meteorology Department merged with Earth and Planetary Sciences—the final step in the formation of EAPS.

The newly configured department expanded its scope, according to Dean of Science Eugene Brown, so that it now "covers the whole solar system." The change was more than just one of semantics.

"There's a new paradigm that's emerging," Tom Jordan said. "We're trying to understand the Earth as a whole, not just the pieces.



It is a fundamentally new enterprise, and this department can lead in that direction."

The department that at one time consisted of William Barton Rogers and a handful of students currently engages about 39 faculty members, 90 researchers, and 180 students working in earth sciences, planetary sciences, geophysics, atmospheric dynamics and chemistry, meteorology, and oceanography.

The Centennial Award was presented to Cecil Green at a banquet at the Charles Hotel in Harvard Square on June 9. In accepting, Green reminisced about his association with the Institute, Bob Shrock, and the department.

Just before the celebrants took to the dance floor, Professor Tom Herring, PhD '83, read a note from former faculty member Irwin Shapiro (now head of the Harvard-Smithsonian Center for Astrophysics), who was unable to attend the festivities: "Congratulations on the first 100 years. Here's to another 100 years of this department, whatever name it [might wear]. I've already made reservations for the bicentennial."

However, in light of some of the dire predictions about global warming—the inundation of coastal cities from the melting of polar ice caps, the destruction of stratospheric ozone, and other forms of environmental havoc—there is legitimate question as to whether humanity will be around 100 years from now, let alone this department.

"We've all heard the saying, 'Save the planet,' Dean Brown observed. "Well, the planet is going to survive. What we're concerned about is whether we humans will survive as a race on this planet." In the future, he stressed, the EAPS Department can provide leadership on critical issues needed to help ensure that survival. □

STEVE NADIS is a Technology Review contributing writer.

Mens et Manus et Deus



*Galileo
notwithstanding,
religious
groups turn out
to be large,
numerous,
and thriving
on the MIT
campus.*

The MIT campus has always been a pointedly secular place. Founded by scientists and industrialists, and not, like most American private colleges and universities, by clerics, it not only has never had any affiliation with any denomination, but has no Institute-appointed chaplain. When the trustees approved Bosworth's plan for main buildings inspired by the Pantheon, it was clear that these temples were dedicated not to any gods, but to technology and to the hosts of science. MIT's faculty members devote their lives to interpreting natural, not supernatural, events, place their confidence in step-by-step rational thought rather than in leaps of faith, and require their students—who adopt virtually monastic self-discipline to meet the demands of the rigorous curriculum—to do the same.

Given all that, many people might expect to find little enthusiasm for traditional religion at MIT. They'd be wrong. In fact, there's a thriving community—or rather many thriving communities—of students who give serious attention to their spiritual lives, ranging from Muslims to Catholics, Baptists to Jews, Lutherans to Vedantists, and including a wide variety of ethnic Christian worship groups.

"When I tell administrators here that about 400 students attend our mass every Sunday," says Father Bernard Campbell, the MIT Catholic chaplain, "the response from many is, 'Surely you're joking, Father Campbell!'" But the fact is that active members of the Tech Catholic Community (TCC) form the largest social group on campus, according to graduate student and past-president Bert Hootsmans, and they make up one of the

strongest campus Catholic groups in New England.

About 180 people come regularly to the MIT Islamic Society's Friday services, says Ali Youssef, a graduate student in civil engineering who helps coordinate the group's program. Like the TCC, the society is one of the largest student groups of its faith in the region. Youssef notes that Muslims from all over the greater Boston area participate in MIT Islamic Society social activities.


Rabbi Dan Shevitz says that MIT Hillel, the campus center for Jewish culture and religion, has a core of about 50 strongly active students and a membership roster of between two and three hundred students.

If all the students who take an active part in the campus's varied non-denominational Christian groups—the Campus Crusade for Christ, the Black Christian Fellowship, the Chinese Bible Fellowship, the Seekers, and many others—were added together, their numbers would rival and perhaps even exceed membership numbers for any other single group.

This isn't a news story: it doesn't appear that there's either a religious revival or a turning away from the traditional faiths at MIT. According to the chaplains and other leaders of campus religious groups, all of whom have been posted at MIT for four years or more, there's currently a remarkable stability in both membership numbers and commitment levels—given the fact that about a fifth to a quarter of each group's membership turns over every academic year. In lots of ways, then, this is a good time to look at the roles religion and the various campus religious organizations "normally" play in many MIT students' lives.

So why do so many MIT students,

LESLIE BRUNETTA is a freelance writer and the daughter of Frank Brunetta, '49.


 For 20 years,
 the MIT
 Lutheran-
 Episcopal
 Ministry
 has sponsored
 public forums
 on the areas
 where
 technology
 meets society.



who attend an institution that's famous—if not infamous—for its academic intensity, and who have precious few hours to spare from their studies, take time out for their religion? Because it's not a matter of taking time out, says Bert Hootsmans: "The TCC takes the stance that, look, religion is not something you just practice on Sundays; it's an integral part of your life, of your whole choice of what your morals are and how you think about your family, your work, and the larger community."

For Hootsmans, as for many if not most of the students involved in the campus's religious organizations, this view is nothing new. He grew up in a religious household, was involved with the Catholic student center while an undergraduate at Harvard, and naturally became involved with the TCC once he arrived at MIT.

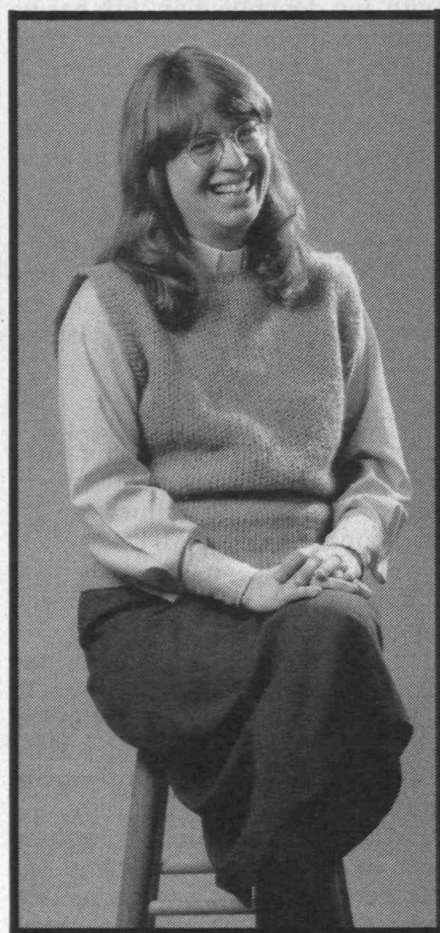
For Jordan Ditchek, '91, an Orthodox Jew, the strength of MIT Hillel's program was a precondition for applying here: "What I found at MIT was a small but active community, and I was comfortable that whatever I didn't get on campus I could get from other campuses and communities in the area. Kosher food is very important to me, and that would have been a concern on other campuses; but with the kosher kitchen here, it's never been a problem."

For students like Hootsmans and Ditchek who are secure in their faiths, the primary role for campus religious organizations is to provide easy access to worship services and an environment that can help them to deepen their understanding of their faith. But not all students, even those from religious backgrounds, are so sure about what religion means to them.

"I think a lot of students when they come here say, 'I'm grown up now. My parents made me go to church when I was a kid, but it's time to try my own life now. Most of my friends aren't going to church, so why should I?'" says Scott Paradise, MIT's Episcopalian chaplain. "I think what strikes many students when they arrive here is not the pluralism of MIT

society but the overwhelming scientific view, the belief that science is *the* important human activity and it's the only reliable road to truth." Yet, says Paradise, this doesn't mean that these students don't still grapple with all the same issues of belief and of forming an ethical code of behavior that religions have traditionally addressed.

For students who don't have an es-



Susan Thomas, Lutheran Campus Pastor

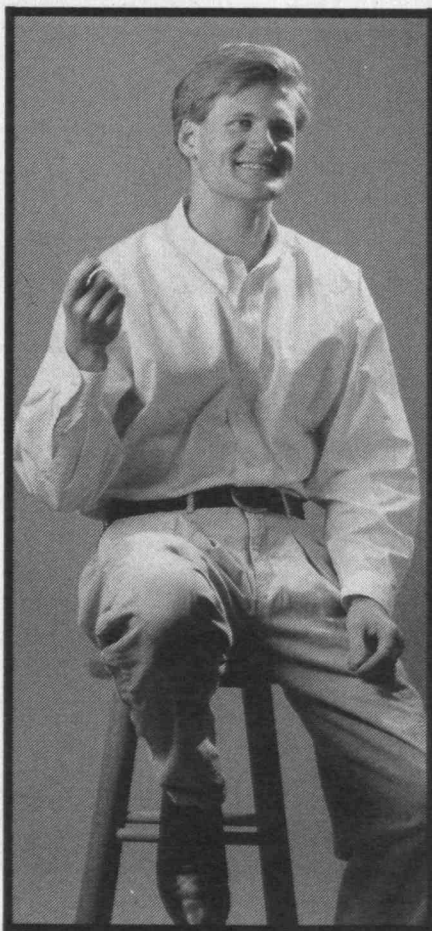
established religious commitment, says Jim Layman, the MIT director for Campus Crusade for Christ, the task for religious groups is to remind them—without annoying them—that such groups are around and that they can offer something the scientific view cannot. "As students are exploring and coming to grips with what kind of career they want, what they're go-

ing to believe for the rest of their lives, what their morality is going to be based on, we can provide a spiritual background that will help them to grasp a value system and a belief system."

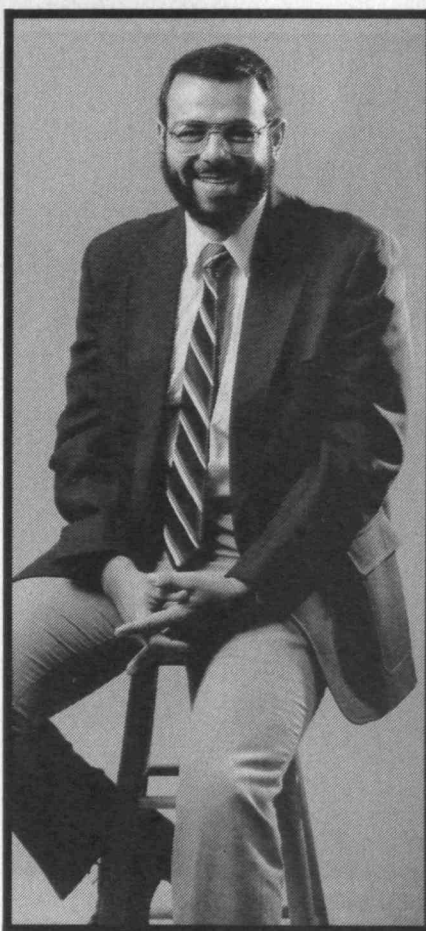
To meet the needs of students who are just curious and people who are already sure of their faith, many of the large campus religious groups provide educational programs. Campus

every term. The Vedanta Society's Swami Sarvagatananda, who has been at MIT ever since President Killian first invited him to the campus when the chapel was built in 1955, conducts a lesson on the Bhagavad Gita in the chapel every Friday. He also gives special lectures on Vedantism (a non-denominational, non-doctrinal branch of Hinduism) during the January IAP period.

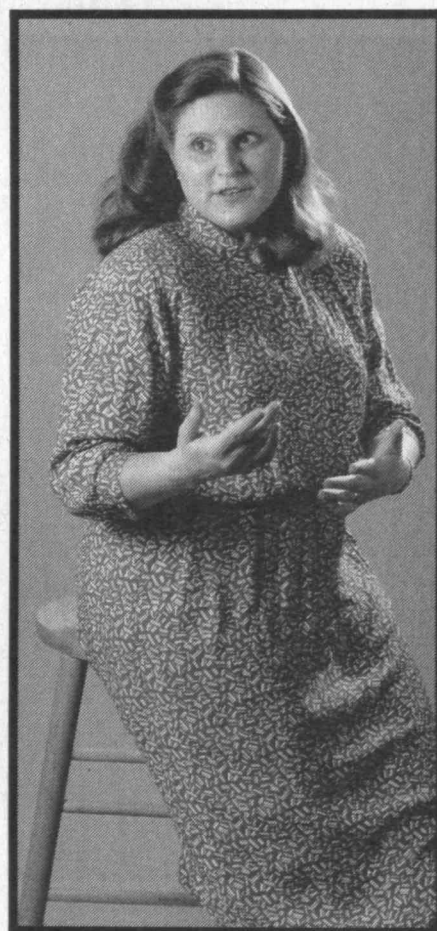
"I think that as soon as many students who have been brought up in a mainline church step on campus, they realize what a pluralistic and secular place MIT is, and they feel a bit isolated," says Susan Thomas, the Lutheran campus pastor, who shares responsibility with Scott Paradise for leading the MIT Lutheran-Episcopal Ministry (LEM). "So there is that sense of wanting to find people who



Bert Hootsmans, G, Tech Catholic Community



Ali Youssef, G, MIT Islamic Society



Betsy Draper, Baptist Chaplain

Crusade for Christ offers introductory sessions on Christianity and conducts numerous small-group Bible-study classes throughout the week. Student members of the MIT Islamic Society conduct "introduction to Islam" classes in English and classes on more advanced doctrinal topics in Arabic throughout the year and bring in at least one guest lecturer ev-

For many students, the religious groups also provide a sense of community that can be otherwise hard to find at MIT. "I see how much they have to spend time alone studying just to survive here," says Betsy Draper, the Baptist chaplain, "so we try to encourage dialogue and participation and encourage them to think about others."

understand their perceptions of the world. I think their scientific training sometimes stops them from taking emotional or intuitional truths very seriously, and I know that people who have been with us for a while have appreciated having a group that they can feel comfortable revealing that part of themselves to."

Tony Lee, SM'87, a graduate student

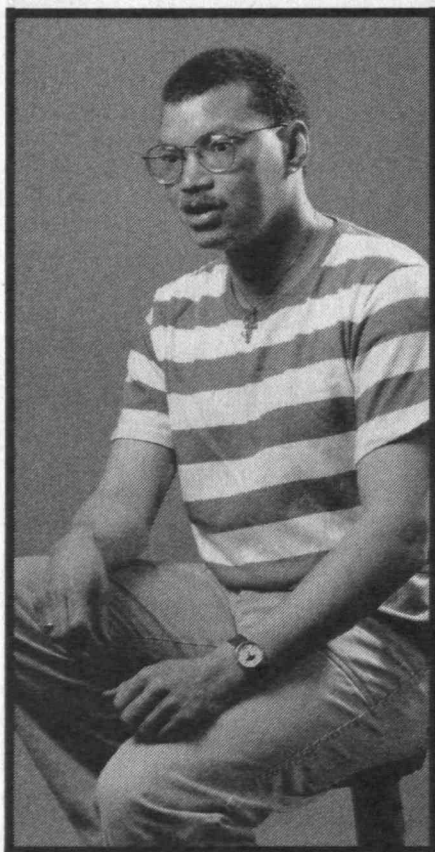
in civil engineering and member of the Black Christian Fellowship, says that providing such a sense of community is also an important part of his group: "MIT is a very stressful place and there's the potential to become isolated and depressed. So we try to form a network to meet not solely our religious needs but also our other needs. We'll go out to dinner on the holiday weekends, for instance, to get

Youssef, as well as the opportunity to socialize with people who share those beliefs.

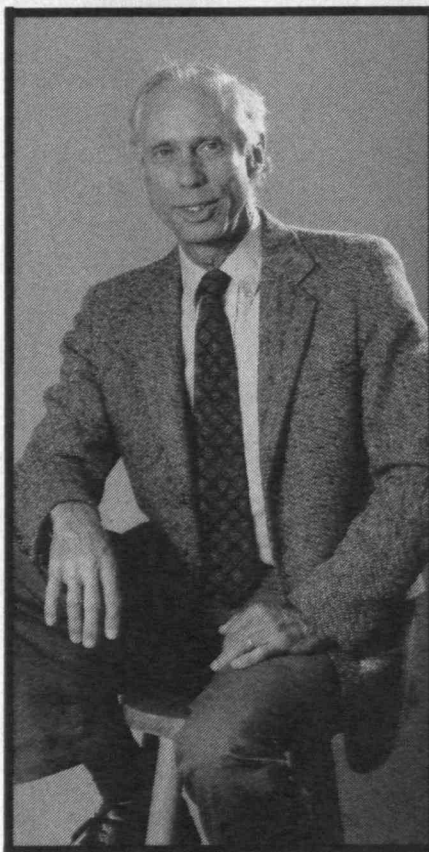
Through their dinners and parties and through joint charity fund-raising projects with other mosque congregations, Islamic Society members have forged strong ties with Muslims on other Boston-area campuses as well as with noncampus Islamic groups. This connection with the larger communi-

ute their time to area soup kitchens, homeless shelters, and Habitat for Humanity home-building projects (the campus chapter was established and funded its first year by the Baptist ministry). They volunteer to teach religious and other subjects to area children and serve as Big Brothers and Big Sisters.

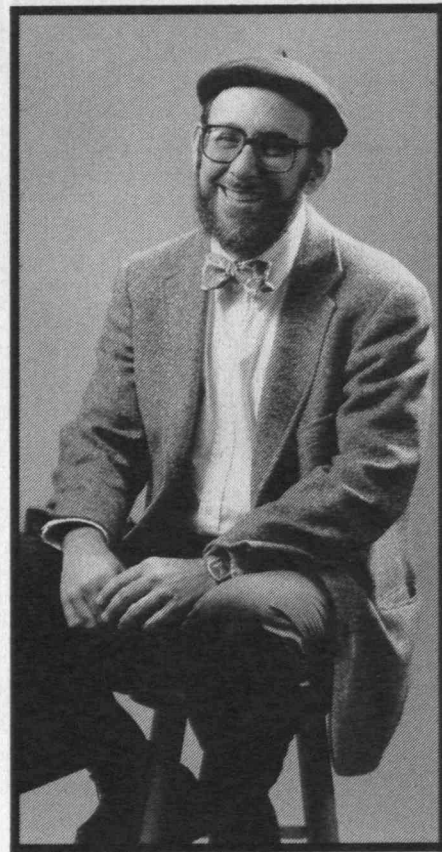
If religion has a strong position in the life of MIT, should we be sur-



Tony Lee, SM '87, Black Christian Fellowship



Scott Paradise, Episcopal Chaplain



Rabbi Dan Sberitz, MIT Hillel

away from campus for a little while. We just try to get to know one another so that if anything goes wrong, we can call and just be encouraging to one another."

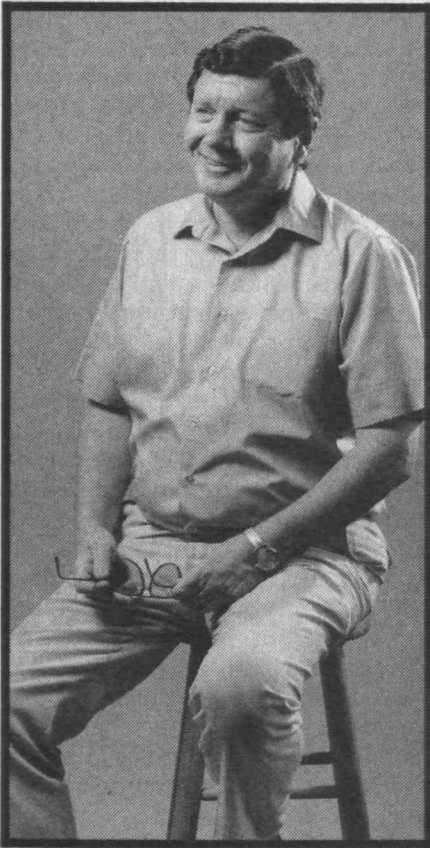
A significant number of students adhere to orthodox religious bans on drinking or premarital sex. The religious groups offer support for the belief that such ideas are worth defending against occasional peer pressure to abandon them, says Ali

ty is also important to members of the other religious groups. Jordan Ditchek, for instance, says that Jewish families around the city often invite MIT Hillel members to spend the holidays with them. The Lutheran participants in LEM wrote a book titled *Excellent Words: Inclusive Language in Scripture and Liturgy* for use by all members of the Lutheran community. And significant numbers of members from all the religious groups regularly contrib-

prised? Are these students anomalies in the battle between faith and reason? Members of the religious communities say absolutely not. "In fact," says Tony Lee, "my own opinion is that at a place like Brown, where I did my undergraduate work, the atmosphere encouraged you to create your own life philosophy; because of that, many people were actually less receptive to organized religion. At MIT, a scientist presented with an argument will

strive to say yes or no rather than try to tread some middle ground. So actually I've found people more open to hearing about Christ and Christianity here than at other schools."

Bernard Campbell echoes Lee's view: "It's categorically false, this idea of science versus religion. Granted Galileo, and apologies all round. But the fundamental issues between religion and, broadly speaking, the



Father Bernard Campbell, Tech Catholic Community

academic community are not fundamentally those over chemistry, biology, and physics. The real struggles are with psychology, sociology, anthropology, although even a lot of that is changing as people in those fields are rethinking their ideas about religion. I've read that if you go back and look at the biographies of leading academics from the 1890s on, the highest correlation of religious practice and belief is with the natural scientists."

From a Muslim's point view, says Ali Youssef, religion and science are uniquely suited to one another: "Muslims are ordered to be useful in their jobs, to be educated, and to improve what is around them, and science conducted in this way is considered an act of worship."

The challenge, then, say these religious scientists, is not to reconcile science and religion—there's no need for that—but to recognize the extent to which belief in and practice of each can inform the other. Swami Sarvagatananda's assistant, Cyrus Mehta, PhD '74, now on the biostatistics faculty at Harvard and head of his own software company, explains that a science background can help those studying Vedantism to frame some of the questions that aid spiritual growth. "Vedantism is different from Christianity, for instance, which asks that you accept some things purely on faith. The way that Vedanta looks at things, you could say that religion is scientific. In science, you use observation and experimentation to uncover the laws that govern natural phenomena and then you try to make inferences from that. Well, in religious matters [Vedantists] also have that freedom to experiment, but what [we] are investigating is the inner self, the question of where does the I consciousness come from and what moral principles should guide its actions."

Furthermore, Mehta and others say, the spiritual and moral values nurtured by religious teachings can be a powerful help to scientists confronting tough questions. "MIT is one of the capitals of modernity," says Brian Sliker, a graduate student in economics and member of the LEM congregation, "and there's always the old question of what do you do with all these toys that you're making. It's not enough to say you'll just rely on the ambient values to help you make decisions without examining those values. They're not really ambient—they come from somewhere and a lot of where they come from is religion."

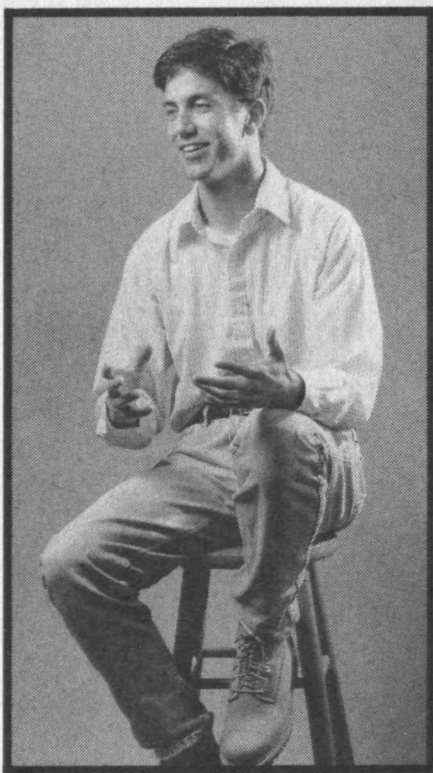
❧

*"Muslims are
required to
be educated
and to improve
what is around
them; science
conducted
in this way
is an act
of worship."*

❧

We ought to remind people of that."

Jordan Ditchek agrees: "Technology and progress are always bringing us to new ethical issues. Religion—I can speak for Judaism—does provide a very strong background and a moral code." Ditchek points out that it's often the religious organizations on campus that sponsor forums and lecture series on ethics, particularly as they apply in the workplace, a topic that he says is "very hot on campus right now."



Brian Sliker, G, Campus Lutheran-Episcopal Ministry

The Lutheran Episcopal Ministry has for 20 years sponsored the Technology and Culture Seminar, public forums on the areas where technology meets society. "The basic questions at these seminars," says Scott Paradise, "are 'What are the concerns of God in the future of the human race? What are the moral and social and cultural implications of science and technology? And are there any ways these social and cultural and moral dimensions of experience ought to guide the scientific enterprise?'"

In his 1954 President's Report, as he considered MIT's mission to give attention to students' spiritual as well as professional education, James Killian asked, "How does a secular institution such as MIT handle this responsibility properly? It does so by maintaining an atmosphere of religious freedom and, within this environment of freedom, by providing adequate opportunity for its students to deepen their understanding of their own spiritual heritage and to pursue freely their own religious interests and to worship God in their own way. . . . Its institutional policy must be one of equal opportunity for all beliefs and outlooks, which means not only that it must express no bias toward any creed but also that it must not exhibit any bias toward religion itself."

In making MIT's institutional position on religion clear, Killian articulated a tension that may be peculiarly American as well as peculiarly MIT-ish. It is a tension that the campus chaplains and some of their students still feel today: they are free to practice their religion and the administration welcomes their presence on campus, but there's only so far the Institute will go to actually encourage or recognize their activities.

For instance, like other universities, the Institute provides the chapel, space for a mosque in Ashdown House, and office space for the various chaplains and for the religious groups that don't have chaplains; but unlike other universities, it doesn't appoint chaplains itself and pays no salary to any chaplains or other group leaders. And although all leaders of the religious groups report smooth relations with the administration, many report occasional frustration that the relationship isn't closer.

"We—all the chaplains—are going to have to work on having more visibility," says Betsy Draper. There have been many reports over the past five years or so of student recruiting by various religious cults on campus, and Draper believes that the administration's hands-off-religion policy leaves some students vulnerable: "Students

don't know where to go for help." (On the other side of the coin, however, Tony Lee of the Black Christian Fellowship says there are some benefits to the administration's hands-off policy: "I am just thankful that MIT continues to let us meet. I've heard that some other campuses are no longer so open: because of the zeal of one or two groups, people have gotten so fed up that groups not officially affiliated with some particular church are no longer officially allowed.")

Draper continues, "I also see that when there are emergencies on campus like suicides or emotional breakdowns, the chaplains usually don't get contacted. We've just begun to see a little communication between the Medical Department and chaplaincy when it's called for." Communication with medical staff is important, Draper says, because there are situations in which a student's religious convictions have impact on what constitutes appropriate physical and mental health care.

Dan Shevitz shares Draper's frustration and speaks for many of the other chaplains when he asserts that, "The religious communities here are generally welcome and tolerated, but we're still regarded by much of the MIT culture as irrelevant or otiose. This is aggravated at MIT as opposed to, say, Harvard, which started as a religious institution. Harvard has moved beyond that, but it still has enormous respect for its religious institutions as communities that can propel ethical and moral and spiritual issues to the forefront of campus life. MIT doesn't have that tradition, and very often I think that those contributions escape the notice of the people who are concerned about the quality of life at MIT."

But Shevitz also speaks for the other chaplains when he says, "Despite the frustration of invisibility, I stay here because the students are great: they're smart, they're open-minded; you can learn a lot from them, and if you have something worthwhile to teach, they'll listen—if you can catch them, which is the biggest trick. What more could a teacher ask for?" □



CLASS NOTES

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As our numbers have gone down to less than 20, there is very little personal activity to include in these notes. I can report, however, that I was present at Technology Day on the Cambridge campus last June 8. In particular, I was impressed by the activities of the Cardinal and Gray Society. You will recall how 1918 became very active about 25 years ago when, in addition to Technology Day, we had mini-reunions through the year. As our numbers decreased, we invited 1917 and 1919 to join us in this activity. Within a short time, we included all classes out more than 50 years. This activity became the Cardinal and Gray Society—it is booming—and may it grow! I hope the society can follow our example and have a fall meeting at Endicott House.—**Max Seltzer**, North Hill, Apt. B403, 865 Central Ave., Needham, MA 02192

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We report the death of our classmate, **Aubrey P. Ames**, on March 11, 1990, at age 95. He was active to the time of his death in San Francisco, where he lived and where we enjoyed many contacts with him. He was interested in MIT and his classmates. He served as an executive of the Socony Oil Co. in Manila, The Philippines. While there, he was interned as a civilian prisoner of the Japanese during World War II. Following his release, he moved to San Francisco where he lived until his death. Surviving are his wife, Erma, of San Francisco, a brother Harold L. Ames, two nieces, a nephew, and several cousins. After cremation, his ashes were spread on the Pacific.

Don Way and his wife, Barbara, recently visited their son who lives near Baltimore. While in the area, Don telephoned **Francis Weiskittel**, and they enjoyed a talk. The following day, Weiskittel called a number he found in the directory, the only name recorded under Way, and they all met at the golf club, enjoyed dinner, and shared MIT memories. I found this chain of events very interesting. So, Francis, thanks.

I was happy to receive a letter from **Doc Flynn**, who now lives in town because he "has no wheels." Most of us old-timers are finding we need wheels to get around.

A nice letter from **George Michelson** tells me of his having eye surgery on both eyes, which are giving him some trouble. But he still goes to business daily in spite of his age. Good work, George.

I am glad to be able to write these class notes for the *Review*, and if you write to me I will let our remaining classmates hear of you. Kindest regards.—**Bill Langille**, secretary, P.O. Box 144, Gladstone, NJ 07934

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Please send news for this column to: **Harold Bugbee**, secretary, 3 Rehabilitation, Woburn, MA 01801

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One death was reported this month, that of **H. Chester Nelson** of Augusta, Maine, on January 23, 1990. Nelson was not listed as a classmate in the list of 1921 we received a year ago. However, the *MIT Alumni/ae Register* reports him as doing graduate work with our class in 1921. He served as a 2nd lieutenant in World War I. Following graduation from Bowdoin in 1919, he went to MIT for graduate work and then went to work as a chemist with Goodyear Tire Co. in Akron, Ohio, and later on with General Tire Co. in Buffalo, N.Y. In 1921, he became a science teacher at Windham High School in Willimantic, Conn., where he remained for 46 years until retirement at age 70. During that period, he was principal and acting superintendent upon two occasions. He received a master of arts degree from Columbia University in 1926.

Our condolences are sent to his wife, Hope.—**Sumner Hayward**, secretary, Wellspring House E64, Washington Ave. Ext., Albany, NY 12203; **Samuel E. Lunden**, assistant secretary, 6205 Via Colinita, Rancho Palos Verdes, CA 90274

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With sadness, I must report the death of our class president, **Parke Dinwiddie Appel**, on June 7, shortly after his 91st birthday. He had suffered a stroke some six months before, leaving him in such condition that his passing came as a release from an unwelcome quality of life. If I remember correctly, Parke became president after the death of **Clayton D. Grover** and prior to our 40th reunion. Parke was the leader in raising the funds that resulted in the Class of 1922 Professorship and all subsequent related developments. His entire business career was with the telephone company, from which he retired many years ago, moving then from Dover, Mass., to Venice, Fla. He continued to be a leader in MIT affairs in the Venice-Sarasota area until the end. Many of us will recall with pleasure the Alumni Day parties Parke and Madeline had at their Dover home. After the move to Venice, Parke and Madeline came north for all our five-year reunions. As an undergraduate, Parke was a member of Masque, Vectors and Technique Electoral Committee. He was in Tech Show for three years, and his fraternity was Sigma Alpha Epsilon. Our sincere condolences are extended to Mrs. Appel and their daughter Joan.

Those classmates who saw the PBS miniseries *Skyscraper* last May noted that considerable coverage was given to the architectural firm of Skidmore, Owings and Merrill, architects of the subject building Worldwide Plaza. Our congratulations to **Ed Merrill** for being one of the founding partners of this successful firm.

At Technology Day June 8, **Marjorie Pierce** and your secretary were the only '22ers in evidence. The generous invitation by the Alumni/ae Association inviting all alumni who had passed their 65th birthday to be guests at the luncheon in the Athletic Center, while much appreciated, did not result in any noticeable increase in attendance. The total from the classes of 1915 to 1924 was 13. Perhaps we can boost it next year.

Word from **Eastman Smith** comes via the

Alumni/ae Association. He has invented "the most accurate and reliable and possibly low-cost" refraction instrument for measuring eyesight for eyeglasses. Unfunded and built on his workbench, it is patented and has traveled to Chicago, Houston, Boston, and Portland, Ore. Letters of inquiry have come from Scotland, England, Canada, and Japan as well as various parts of the U.S. Eastman says, "MIT people never quit. We live."

A telephone call June 15 to **Ab Johnson** on his 91st birthday, when he was at his summer residence in Michigan, found that he remains well and is still playing golf. . . . In response to the Cardinal and Gray Society Reunion invitation for Alumni Week, **Cliff R. Richards**, now living in Altoona, Fla., said, "I'm sorry to say that I will not be able to attend. I am 94 years old now and while I can still take care of myself, I do better staying right here at the retirement home. I know you will have a fine reunion."

John B. Starkweather, Course I, died December 24, 1989, at his home in Orinda, Calif. Word came to the Alumni/ae Association from Ellen L. Starkweather without further details. Our regrets are extended to the Starkweather family.—**Yardley Chittick**, secretary, Rte. 1, Box 390, Ossipee, NH 03864

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Please send news for this column to: **Frederick O.A. Almquist**, secretary/treasurer, 63 Wells Farm Dr., Wethersfield, CT 06109

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Col. Hap Stern sends the following news. He received a letter from **Franklin Billings**, who reports: "I am now 92 years old. I spend the summer in my small house here in Newport, and in the fall I head for Victoria, B.C., a lovely city at all times of the year." He also talked with **Dick Shea**, class president, who plays golf two or three times a week. "So do I," says Col. Stern. Col. Stern would be pleased to receive more news about classmates' present conditions and activities by phone or mail.

Dick Shea, 6404 21st Ave. West, Apt. M104, Bradenton, FL 34209, wants to hear from all of the classmates. He has volunteered to assemble news of everyone and circulate it. He's looking for information on how and what everyone is doing now—100 words or so. It will be fun to read. He also suggests mini-reunions in various parts of the country, before the big one in 1994. If there are enough favorable replies there may be one or more staged in such places as Florida or wherever there are members located in reasonably large numbers.

An obituary was sent to MIT regarding **Donald G. Bertch** who died in his home in Charlestown, R.I., last March 16. He was the husband of Mary Burney Bertch. He is also survived by two stepdaughters, Carol Lorden and Jane Carter, both of Warwick, R.I. He was treasurer of the Stillwater Worsted Co. in Harrisville for many years.

The Alumni Association was recently informed of the passing of **Paul Caskey**, from Rockford, Ill. He is survived by his son, David H. Caskey, also of Rockford, Ill.—co-secretaries: **Katty Hereford**,

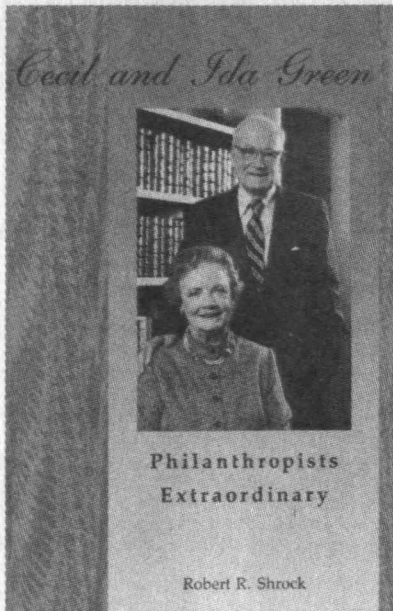
Shrock's Tribute to Cecil and Ida

The first car is a memorable milestone for most of us—a fearsome threat to the budget and a seductive promise of freedom. For Cecil Green, '23, and his wife Ida, the big decision in 1927 led to a year-old Chevrolet touring car (canvas side-curtains) that soon enough became a member of the family. "Tillie," acquired while Cecil was working on neon sign technology for Raytheon in Boston, took the Greens on a 4,500-mile job search when Cecil acquired a severe case of "West Coast fever" almost as soon as they bought the car. A year later—still jobless—the Greens drove back to Boston and signed on once more at Raytheon.

This kind of nomadic life continued through three more cars and upwards of 15 more years, all documented by Robert R. Shrock whose biography of the Greens was published by The MIT Press last year (*Cecil and Ida Green: Philanthropists Extraordinary*).

Before Raytheon, Green had worked for two years at General Electric in Schenectady following his Course VI-A assignment there (during which he had met and successfully courted Ida Flansburgh). Back in Boston in 1928, Green soon moved from Raytheon to Wireless Specialty Apparatus Co. in Jamaica Plain. Then it was back to the West Coast to join Charles V. Litton's vacuum tube laboratory at Federal Telegraph Co., Palo Alto, for a year; to Geophysical Service Inc. (GSI) in Dallas to learn seismic prospecting ("doodlebugging"); back with Federal Telegraph; and once again with GSI. So it was only after seven job changes in nine years that Green finally began building a career as a geophysical party chief and supervisor.

It was hardly an outstanding resume that Green brought to the conference table in 1941 where he and three colleagues were pondering the purchase of GSI. Though GSI was a failing and mismanaged company, this was a big step for all four. The Greens' 25 percent share would cost \$75,000—far more money than Cecil and Ida had. Twice they almost backed out. Finally they scraped the cash together with a \$35,000 bank loan secured by the 1,250



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GSI shares that Green would acquire as a partner. The sale was consummated just two days before Pearl Harbor.

As vice-president, Green's GSI assignment during World War II was to make profitable the company's traditional—but struggling—geophysical exploration business. Meanwhile, partners J. Erik Jonsson and Eugene McDermott went to Washington to propose military applications for GSI know-how. Green did well enough in his task. But the assignments that Jonsson and McDermott brought to GSI turned out to be spectacularly successful, and by 1951 the manufacturing division, Texas Instruments (TI), became the tail that wagged the dog.

When TI went public in 1953, with GSI as a wholly-owned subsidiary, its stock sold on the New York Stock Exchange at \$5.25. Seven years later the price was \$250, and during the next decade TI continued its meteoric rise as "one of the giants of the electronic age," writes Robert Shrock. "The answer to the question—whence came the Greens' wealth?—is quite evident," says Shrock.

Nothing in their lives could have suggested to the Greens that they would rise from ordinary to extraordinary means. The only hint of the future was in a comment attributed to Ida during the partners' dinner to celebrate their acquisition on December 5, 1941. Jonsson is said to have asked Ida, in jest, what she would do in the remote chance that they all became rich. "I'd like to be a philanthropist," she is said to have replied.

The drama of the Greens' life is that transition and the consequences of wealth in the hands of these two unlikely millionaires. Author Shrock, became player in the story when Green returned to MIT in 1950 looking for students to hire at GSI. The Electrical Engineering Department, from which Green graduated, declined. So Green wandered over to Building 24, where Shrock was head of the Department of Geology and Geophysics. A fruitful partnership ensued, and the friendship nurtured by their common interests blooms to this day.

As of 1989, the Greens' joint and separate donations, mostly to educational and health care institutions in the U.S., Canada, and the British Isles, total at least \$150 million. Their gifts to MIT now include professorships, many fellowships, the Green Center for the Earth Sciences, a graduate women's residence, and the Green Center for Physics—not yet built.

As a biographer, Shrock's style is dry, factual, understated—he simply documents the events of the Greens' lives. The reader can't help reflecting on the dramatic contrast between the bone-deep human goodness of the Greens and the much-publicized glitz and self-promotion of some of today's newly wealthy.—John Mattill □

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A report on the 65th reunion is in order. Fifteen classmates, ten wives, and three guests gathered at the Marriott Hotel in Kendall Square, Cambridge, at 5 p.m. on Thursday, June 7, 1990. Registration, reception, and cocktails were followed by dinner at 6. Then a shuttle bus took people to Symphony Hall for the Boston Pops concert. Friday, June 8, being Technology Day, all were on their own and attended the activities of their choice. Most classmates took in the luncheon and got into the group picture taken after the luncheon. At 5 p.m. a bus picked up classmates from the dormitories and hotel and took us to the Faculty Club for a reception and dinner. Our number increased by one when **Maurice Freeman** joined us for dinner. After dinner at a short business meeting, we elected a vice-president, **Don Taber**. Next, **Courtenay Worthington** called on each classmate to give a short resume of his activities in the business world since 1925. The meeting closed with some Tech songs led by **Milt Salzman**. Reunion attendees were: Lucinda and **Gates Burrows**; **Arthur Hall** and **John Koch**, '53 substituting for **Art Hall, Jr.**; **Mary and Ed Harris**; **Bill Herbert** and guests **Mary Anne and Ben Duffie**; **Winthrop Humphrey**; **Wei Z. and Dr. Yu H. Ku**; **Grace and Stanley Lane**; **Ruth and Arthur Odegard**; **Jonathan Peck**; **Milton Salzman**; **Melba and Arthur Sharp**; **Elinor and Sam Spiker**; **Wilmina and Don Taber**; **Maurice Freeman**; **Margaret and Courtenay Worthington**; and **Evelyn and Doc Foster**. **Barbara Peterson** of the Alumni Office attended all reunion activities and kept everything going properly. President **Courtenay Worthington** is to be commended for the planning and organizing the reunion, and **Sam Spiker** deserves congratulations for his work as reunion gift chairman. As of June 8, the total gift exceeded \$1,700,000. **Courtenay** received notes from a number of classmates expressing their regrets at having to miss the reunion.

On a somber note, the passing of three classmates must be reported. **William Muschenheim** died at Ann Arbor, Mich., on February 1, 1990. Bill was a professor of architecture at the University of Michigan.

Katherine H. DeWolf Pendlebury of Bristol, R.I., died at the Hattie Ide Chaffee Home in East Providence on March 31, 1990. Mrs. Pendlebury worked as an architect/engineer. She travelled extensively and lived in Florence, Italy, England, South Africa, and other localities. She made her last trip to Europe in 1980 at the age of 83. She was particularly fond of Austria and northern Italy and has a great interest in the Italian Renaissance, classical Greek, and Roman culture. She was a trustee of the Herreshoff Marine Museum and was a member of the Bristol Historical and Preservation Society and the RI Wellesley Club.

Raymond N. Rowe of South Kingston, R.I., died at the Scallop Shell Nursing Home in Peacedale on April 6, 1990. He was an electrical engineer with the General Electric for more than 35 years before retiring in 1962. He was responsible for 100 electrical patents. A daughter and two grandchildren survive him.—**F. Leroy "Doc" Foster**, secretary, 434 Old Corners Road, P.O. Box 331, North Chatham, MA 02650

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I had a call from **Morris Minsk** to say he would not be coming to MIT as he did last year in his wheelchair because he had been in the hospital. He is much better now. Let's hope he continues to feel better. I am sure he would like to hear from you. His telephone number is (617) 889-3036.

I have asked those of you who are active to write **Dwight "Duke" Taylor**. He came to Tech for Technology Day. His news: "Mary and I just celebrated our 62nd wedding anniversary. Our seven children and spouses, our 19 grandchildren, and our ten great-grandchildren are all well and happy. We feel rich and fortunate. They come and go all summer to the big old farmhouse, and Mary and I spend all year in our little winter house nearby. Come and see us! I am still active in the Franconia Town Planning Board, which has increasing growing pains. I keep up repairing antique clocks. A good hobby! Fond memories of the class of 1926 and MIT."

We didn't have a table of '26 at the luncheon. It was a Cardinal and Gray table, so we sat and talked with other classes.

John Rothery, '42, wrote regarding **Ralph E. Colclesser** of Stuart, Fla., who died April 6, 1990. He had lived in Stuart for 15 years. Ralph was a good friend of John's and a sailing companion who lived in the same condominium. He will be greatly missed. Ralph was with General Electric in Erie, Pa., for 40 years. At retirement, he served as an engineering consultant with International Executive Service Corp. in Seoul, Korea. He was an avid yachtsman, a member of many clubs, and was also active in the Erie Fleet of the U.S. Power Squadron. He leaves his wife, Alice, three daughters, nine grandchildren, and one great-grandchild.

Alonzo W. Ruff of York, Pa., as per his wife, Betty, passed last March 26. He studied mechanical engineering, but we have no more information about him at this time.

Walter E. Newcomb of Buffalo, N.Y., died on November 11, 1989. He designed and manufactured engines and compressors at the Painter Post of Ingersoll Rand Co. He lost his wife, Alura, in 1985 and leaves one son and two grandsons. In looking for this information, I ran into **Bill Meehan's** contribution to his book. Read it! He was your second secretary of the class after the great **Walter "Smitty" Smith**, our first secretary, who lived in Pigeon Cove, Mass. We had a wonderful chance to wear our red coats and meet others who have been out of Tech for 50 years at Technology Day, last June 3 (Friday). On Saturday there was a tour around the Boston area and a stop at the beautiful Boston Harbor Hotel with **Norman Leventhal**, '38, who built and owns it, sitting next to me.—**Donald Cunningham**, secretary, 27 Lowell St., Braintree, MA 02184, (617) 843-2516

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For two weeks last April, our president, **Harold (Bud) Fisher**, and his bride of six months, Janet (Jan), took a cruise on the *Argomot* visiting the Greek islands in the Aegean. The converted private yacht carries only 75 people, making it easy to tie up to docks to let passengers visit the ancient ruins on Delos and windmills on Mykonos. The Fishers started their cruise in a modern way—zooming over air at 45 knots in a hydrofoil. Bud said the air pollution was so bad in Athens that they could not visit the historic ruins. Bud and Jan have set a good precedent for our widowed classmates to take a new lease on life!

We are sorry to report that **Charleton (Pub) Whittier** had his leg amputated last April. Poor circulation and blood clots required the decision. His wife Ruth said that he soon (July) expected to come home after several months in a rehabilitation hospital. "Pub," a nickname known only by his old friends, has attended all our reunions. We are sure he would enjoy some encouragement from his classmates. Address: 2219 Dundas Rd., Toledo, OH 43606.

Albert E. Schaad of Bennington, Vt., died April 27. He and his wife Phyllis lived most of their life in Croton-on-Hudson, N.Y. He was a member of Tau Beta Pi, and was employed for 34 years as a metallurgical engineer at Union Carbide Corp. in

New York City. His hobbies were gardening and crafting creative furniture.

Edward F. Dunn of Hockessin, Del., died February 14. A modest soul, he listed his occupation for our 50th reunion as "paper pusher." He worked for 34 years for Allied Chemical Corp. on the top floor of 61 Broadway, overlooking the Hudson River. In the last decade before his retirement, he pursued a worthy cause—"helping to lessen the impact of paperwork required by the federal government of the chemical industry." Ed married for the first time at 67, to Madeline, having saved his love life for retirement. He contributed to the Department of Oncology at Christiana Hospital, Newark, Del.

We send our sympathy to the widows of these two classmates.—**Joseph C. Burley**, secretary, North River Rd., Epping, NH 03042; **Lawrence B. Grew**, assistant secretary, 21 Yowago Ave., Branford, CT 06405

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Bill Hurst has always been one of our best correspondents. His most recent and very welcome letter tells us that he has now retired from his private consulting practice in petroleum engineering. Bill is widely known in his special area of petroleum reservoir engineering and has written many papers and published books on the subject. Last February he was elected to honorary membership in the Society of Petroleum Engineers. To you, Bill, our hearty congratulations and great admiration!

It was a real pleasure to have an unexpected telephone call from **Chuck Carter** in Montreal, Canada. In our conversation Chuck recalled some of the amusing events that had taken place when he was a high school student in Boston. Such reminiscing can be one of the fun things reserved mostly to old timers.

Technology Day this year brought out a good number of '28ers. The following attended one or more of the various events: **Maury Beren** and grandson **Jeffrey Goldings**, **Frannie Donovan**, **Lazare Gelin**, **Janet and Fred Lewis**, **Marjorie and Al Puschin**, **Florence and Walter Smith**, **Jim White**, **Ruth and Abe Woolf**. Once again special attention was given to Cardinal and Gray Society members (of those classes out 50 years or more since graduation).

Just prior to all the political activity in eastern Europe, Florence and I (your secretary) had signed up for a Danube River cruise touching at six different countries along the way and ending in Istanbul, Turkey. With just a trace of apprehension, we went ahead with our plans. For this we were glad later—it was a wonderful and educational adventure. We hope to tell you more about it at another time. **Frannie Donovan** took the same trip with us, teaming up with **Penny Johnson**, widow of **Robert F. Johnson**, '36. Most of the trip was on the Russian cruise ship, *M.V. Ukraina*, with a Russian crew. We were aware that the passenger list included many other MIT people but would only know who they were by chance meetings. To improve this situation we arranged to have the ship's P.A. system invite all MIT related passengers to the afterdeck which had been reserved for the occasion. There champagne was served and toasts made to MIT, to all her sons and daughters, and to **Priscilla and Paul Gray**, '54. Once initiated, the social period continued for some time with about 38 people brought together (21 alumni and their guests). It is hoped that some of the newly-made acquaintances will continue. **Roy Hopgood**, '38, secured names, class affiliations, and addresses of the whole Tech group. Then, back home, he had the list multigraphed and mailed to all group members. During the party, some very good photographs were taken. We hope there will be an opportunity to share them with you.

With deep regret, we must now report the following classmate deaths. **Albert J. Carey** died April 7, 1990. Al graduated in Course 6, electrical



Champagne and toasts to MIT and to all her sons and daughters! It was on a Danube River cruise last May, aboard the M.V. Ukraina (a Russian cruise ship), that Florence (front row, right) and Walter Smith, '28 (front row, left) had all MIT people called to the afterdeck by the P.A. system.

To their surprise and delight, 21 alums and their guests (a total of 38) appeared for the social occasion. The cruise touched at six different countries, ending in Istanbul, Turkey. Frannie Donovan was along, teaming up with Penny Johnson, widow of Robert F. Johnson, '36.

Roy Hopgood, '38, secured names, class affiliations, and addresses of the whole Tech group. Unfortunately, space does not permit printing all the names, but if you look closely maybe you can recognize some faces. Also, a list of attendees can be obtained from the Review office.

engineering. His lifetime professional career was mostly with the Bell Telephone System where he began with N.Y. Telephone Co. and was later with AT&T. In 1937, he returned to MIT as a Sloan Fellow to earn his master's degree. In addition to World War II military service (colonel, U.S. Air Force) Al served also in several important administrative posts for the Federal Government. Our record shows that Al and wife Flo had two daughters.

John J. Campobasso died of cancer at home on April 18, 1990. We were so informed in a gracious note from his stepdaughter. John graduated in Course 1, civil engineering, and was a sales engineer for E.B. Badger and Sons Co. in Cambridge, Mass. He was closely concerned in the production of vapor compression stills for the distillation of sea water. In later years he had his own small business in Lexington, Mass. John's wife, Myrtle, survives him. John had one son, John J., Jr.

Richard B. Gobel died January 12, 1989. Dick graduated in Course 15, business and engineering administration. Most of his professional life was in sales and business management with Hercules, Inc. (formerly Imperial Color and Chemical). Ruth, his wife for nearly 60 years, died on March 16, 1990. . . . To the families of these departed classmates we extend our heartfelt sympathy.—**Walter J. Smith**, secretary, 37 Dix St., Winchester, MA 01890; **Ernest R. Knight**, assistant secretary, Box 98, Raymond, ME 04071

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Joseph D. Murphy of Saint Louis, Mo., is gravely ill according to a note sent to me by his wife, Ann. . . . **Edwin H. Perkins** of Ipswich, Mass., writes, "I have moved to our cottage where the

tide ebbs and flows twice in 24 hours and it is beautiful. I have had a problem with my heart, which was corrected by inserting a pacemaker to regulate it." Ed still sails and has been for many years associated with the U.S. Power Squadron in the Ipswich area. He is also active as a mason. . . .

Hunter Rouse of Sun City, Ariz., writes, "Your good birthday greetings are much appreciated, as always. I was sorry to hear about your eye problems. Through the past year, Doi has had work done on both eyes, so we have some idea what is involved. Doi joins me in sending our best wishes to you both."

Standish C. Hartman of Englewood, Fla., writes, "I manage to keep busy but at a slower pace. I usually work three-to-four hours in the yard (weather permitting) in the morning, rest or read in the afternoon, and watch TV mostly, sports and newscast. I have been setting up all my financial assets and accounts in the computer making it easier for my executor to settle my affairs. My health is generally good with a few minor problems. . . . **Louis Southerland** of Austin, Tex., writes, "My wife, Jeannie, and I have recently returned from a visit to London (our 10th trip to that marvelous city). Next month, we go to Laguna Beach, Calif., where I will join several watercolor painters and paint each day some of the lovely scenes on the coast. We hope to be in New England in the fall for a visit to that beautiful area, which we always love. Although I am retired now, my architectural and engineering firm founded here in 1935, continues to do well with managing partners carrying on in a fine way."

Henry F. Robbins of Gillette, N.J., is recording and duplicating lectures and music at the Bernands Township Library at Basking Ridge, N.J. . . .

Jonathan McCray of Baltimore, Md., sends a note: "My wife, Isabel, and I sold our house and

land on April 20 and left Arkansas for good. We went to stay temporarily with Isabel's sister, Mary, who was with us at the 60th. We stored our furniture until our house, which is under construction in Bel Air, Md., is ready for occupancy. This is quite a change, but Isabel wanted to be close to her sister and her nephews and nieces in case something happened to either one of us. Sorry to hear that you are suffering from Bells Palsy, but I trust it will soon be better with no ill effects. I have had cataracts removed from both of my eyes, which improved my vision well enough to get a new license in Maryland." Now that he is over 80, his auto insurance company in Maryland will not underwrite his policy, so he will have to be insured through a high risk pool. By the time you read this column, the McCrays will be at their new address: 863 Flintlock Dr., Bel Air, MD 21014. They send kindest regards to all our classmates.

John Happel of Hastings on Hudson, N.Y., does not know the meaning of retirement. He is currently researching and experimenting to find a good method of removing impurities from substandard natural gas. His wife, Dorothy, who is an accomplished musician, gave a concert in Carnegie Hall using a plastic violin, first ever. John says, "It was so nice to see you both at the 60th last June. Too bad we get old faster than reunions come along these days. Last January we went to Barbados for a couple of weeks, which was lots of fun. Besides swimming, we had a ride in a submarine and visited some beautiful gardens."

Joseph L. Speyer of Newton Center, Mass., our longtime class treasurer, sends a note: "My wife, Ruth, and I celebrated our 60th wedding anniversary on June 9 with our entire family: our daughter, Lois, and son, Jason, with their spouses, children (seven), and grandchildren (three). We have much to be thankful for." Joe and Ruth have

the rare distinction of heading a three-generation MIT family: Joe, '29; son Dr. Jason, '60; and grandson Gil, '92. Dr. Jason was chosen to be the 19th Minta Martin Lecturer. This lecture is delivered in conjunction with a professorship established in 1954 in honor of Jerome Clarke Hunsaker, a leading figure in aviation for many years and former head of the MIT Aeronautical Engineering Department. Currently, Dr. Speyer is a professor in the Department of Mechanical, Aerospace and Nuclear Engineering at UCLA.

I regret to announce the deaths of **Richard S. Roberts**, Newark, Del., on February 13, 1990, and **Aaron Bernstein-Brandon** on April 22, 1990. Mr. Roberts was a design project manager at the Du Pont Co. from 1950 until his retirement in 1968. He started with the company in 1930. In 1933, he was transferred to the engineering department, where he was a design, senior, and principal engineer. His wife, Dorothy, died in 1987. He is survived by two sons, Richard S. Jr. of Bethesda, Md., and John A. of Maryland, and two daughters, Dale R. Megill of North Star and Constance R. Amend of Burlingame, Calif.

Bernstein-Brandon, 85, was known as mayor of Uphams Corner. He was a retired shoe merchant and an Uphams Corner resident for 46 years. He was the founder of Automat Shoes on Dudley Street in 1931.—**Karnig S. Dinjian**, secretary, P.O. Box 83, Arlington, MA 02174, (603) 926-5363, (617) 643-8364

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Although we have lost about 70 classmates since our 55th reunion, the attendance at our 60th reunion very nearly matched that of our 55th. Some 34 classmates, 20 wives, two sons, and two daughters attended. Of the classmates on my active list, 19 percent attended this year as compared with 15 percent at the 55th.

The initial event was a class dinner at the Faculty Club, followed by our quinquennial class meeting, at which the principal business is the election of officers. Unfortunately, **Ted Riehl** has developed health problems that prevented him from attending the reunion and from continuing as president. Also, as earlier reported, treasurer **Ed Kingsley** died in March. Hence nominating chairman **Jack Bennett** had to develop an essentially new slate of officers. His choices, all duly elected, were: **Ed Pritchard**, president; **Yicka Herbert**, vice-president and treasurer; **Dave Houston**, agent; and me as secretary.

As part of my report I compiled a number of statistics. According to my records, which could be in error, our oldest survivor is **Mark Culbreath**, born in 1898. The next oldest is **Joe Kania**, born in 1901, followed by **Granger Schrader**, **Bill Harris** and **Irving Dow**, born early in 1903. Our youngest survivor is **Sol Uman**, who was born in August 1910 and thus was 19 years old when he graduated. Next youngest in order are **Win Hartford** June 1910 and **Paul Wang** February 1910. The record for great-grandchildren appears to be held by **Bob Quinlan**, who has seven. Since retirement most of us have moved to other climes, but 30 still live in their 1960 homes.

The tour of Boston on Thursday morning impressed upon us the many changes that have occurred in recent years, and especially the number of new buildings that have been designed by MIT-trained architects. The tour was followed by a pleasant lunch at the Museum of Fine Arts, and later in the day, a buffet at McCormick followed by MIT night at the Pops. The usual Technology Day events took place on Friday. The reported class gifts were impressively large, due in some measure to the fact that MIT includes all giving for the preceding five years in the reported totals. Of particular interest to our class was the announcement that **Dave Houston** and his fundraising committee had been able to report at total of somewhat more than \$800,000.

The final event was a class dinner at Hampshire House near Beacon Hill, a delightful spot

for such an affair. At the dinner I arranged a display of old documents, including copies of the issues of *The Tech* which reported the "riot" (in which many of us must have participated) on the eve of the 1926 freshman-sophomore field day; comments on the riot by the *Boston Post*, the *Boston Transcript* and the *Harvard Crimson*; and a *mea culpa* editorial by the editor of *The Tech* entitled, "In Sackcloth and Ashes." During the reunion I picked up a number of items about individual classmates that I will save for a later issue.—**Gordon K. Lister**, secretary, 294-B Heritage Village, Southbury, CT 06488

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In June, Mildred and I visited the MIT campus for Technology Day, hoping there would be some classmates there, but finding none. We brought along Marion and Joseph Rehler, '30, who have both given up driving. I see Joe quite often, as he is a retired Navy captain, and we both play in the retired military golf league at Pease Air Force Base. There was a short reception for class secretaries before the alumni/ae lunch, and I was happy to meet some of the staff and to talk with the few class secretaries who attended. I wanted to listen to the environmental discussion at Kresge before the dinner, but everyone else had the same idea—and they got there earlier.

John Swanton writes from Westport, Maine, that he had a call from **Joe Buswell**, who was visiting a friend nearby. The call invited John to come over and meet the new Mrs. Buswell! Joe lives in Sun City, Ariz., and in March he married Evelyn Engelbert. For a first honeymoon they flew to New Orleans and took the *Queen of Bermuda* to Grand Cayman, Costa Rica and Panama, where they went halfway through the Canal and back out to Aruba, San Juan, St. Thomas, St. Martin and New York. After their jaunt to Maine, they planned to set off for Waikiki and then—presumably a second honeymoon—a 45-day round trip to Buenos Aires on the freighter *Americana*. Louise and John couldn't top that, but planned a three-week trip to the Queen Charlotte Islands and southern Alaska, going over the route John's father took many years ago as a Smithsonian ethnologist, studying the Indians of the area, chiefly Haida and Tlingit. John says, "Our interests won't be quite so scientific."

By the time you read these notes, plans for our 60th reunion should be well under way.—**Wyman P. Boynton**, secretary, 668 Middle St., Portsmouth, NH 03801

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Technology Day was a beautiful summer day. The following members of our class attended part or all of the activities: **William Bannon**, **Wendell Bearce**, **John Brown**, **Melvin Castleman**, **Al Dietz**, **George Falk**, **Frances Gowen**, **Henry Johnson**, **Douglas Miller**, **Albert O'Neil**, **Charles Taylor**, and **Thomas Weston**.

I thoroughly enjoyed the debate on global warming. My conclusions were that while current predictions are not certain they are serious enough that the government should keep on studying and reforesting. And we, as consumers, should develop good habits in our energy use and waste disposal.

There was a fine memorial service at the MIT chapel for all MIT alumni/ae who died in the past year. Our departed classmates were listed as follows: **Sidney G. Albert**, **Thomas Anderson, Jr.**, **George R. Brodie**, **Robert D. Butler**, **George E. Connor**, **Don E.B. Corson**, **Addison S. Ellis**, **Charles A. Fenno, Jr.**, **John M. Graham**, **George L. Green**, **C. Vance Hale**, **Eugene Kitendaugh**, **Willard A. Meyer**, **Donald K. Morgan**, **John O. Patterson**, **D. Dana Price**, **Peter P. Shelby**, **Francis R. Smith**, **W.C. Sprenger**, **Edward D. Stevens, Jr.**, **William A. Warrick**, **Robert West**.

John Brown, our class president, conducted a class meeting on Friday afternoon, which was at-

tended by most of our Technology Day participants. **William Pearce**, our class treasurer, reported that our yearly expenses were small and that our balance as of May 1, 1990, was \$2,484.

We discussed some preliminary plans for organizing our 1992 reunion. Everyone agreed to help in any way they could. More specific information will be forthcoming at a later date.

We were informed that our classmate, **Ivanhoe P. Denysen** died in January 1990 in Montreal, Canada. When more information arrives, we will pass it on. . . . **Adolph Warsher** retired from Draper Laboratory in 1988. . . . **Julius Grozen** is retired—he just celebrated his 80th birthday. He does a great deal of traveling. He has two children, two grandchildren, and three great-grandchildren. . . . **Richard Park** and **Irving Kalikow** report good health and are enjoying retirement.—**Melvin Castleman**, secretary, 163 Beach Bluff Ave., Swampscott, MA 01907

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Obits. **Walter F. Swanton**, January 19, 1990; employment included Bureau of Reclamation, Jackson and Moreland, U.S. Naval Academy, Pfaudler and B&W Lynchburg. . . . **Niaz Mostafa**, April 1989, no further information, apparently a widower. . . . **Fred Murphy**, May 8, 1990; class officer, retired, former owner of Standard Plastics, Attleboro; director of Attleboro Electric Co., Sturdy Memorial Hospital, YMCA, Trustee, Attleboro Public Library. A very active, wonderful man and a good friend of your secretary. Mrs. Anne Murphy is at 46 Bridge St., East Falmouth, MA 02536. . . . **Andrew Regan**, May 15, 1990, Kingsport, Tenn. Entire career with Tennessee Eastman and Oak Ridge during World War II. Organizer of a cerebral palsy center and of the Palmer Memorial Center for Crippled Children. Active in Easter Seals work. Mrs. Arlene Regan, 100 Netherland Ln., Kingsport, Tenn. . . . **Philip S. Cook**, June 3, 1990, retired as research and development laboratory manager of Allied Chemical, Marcus Hook, after 30 years of service. Mrs. Loraine Phillips Cook of Kendal Research Fund, Kennett Square, PA 19348. . . . **W.D. "Bill" Harper**, DC, March 6, 1990; widow, Dr. Bobbie Harper, Route R2D4, Box 1088, Hattiesburg, MS 39401. Anyone who remembers Bill Harper should please contact your secretary for copies of the obituary. He was a remarkable man and made a significant contribution to the practice of chiropractic in the United States.

Notes from. . . . **Stephen "Steve" H. Rhodes**, general manager, M.M. Rhodes and Sons, Taunton. In 1860, the company made coffin nails, saddle nails, and upholstering nails. Today it continues under the same ownership and management; Steve ME reports that the company now produces staples almost exclusively. . . . **W.W. "Bill" Pleasants** recently served as expert witness in a \$4 million lawsuit, via videotape at the county courthouse near his home in Delaware. The case involved seven years of work, two scale models he had built to demonstrate the accident, and a review of over 700 pages of deposition. His career in engineering and construction includes a commendation by USAF electronic command for pre-scheduled completion of early warning system at Clear, Alaska. . . . **Ed Atkinson**, Course V, says he has read every class notes column since 1929! He reports that **Siebert Duntley** is now making a new translation of the Bible. . . . **Mal Mayer**, of Washington, Maine, did an Elderhostel in London in February. Pretty enjoyable. Any classmates are welcome to stop by and "help him fix the screen door" while enjoying the loons. . . . **Jack Andrews**, a good correspondent, met recently with **Bob Rogers** who worked with Westy at Ingersoll-Rand. More of Rogers next issue. Jack is now a board member of the MIT Club of Princeton.

Please send bio information to: **William B. Klee**, secretary, P.O. Box 7725, Hilton Head Island, SC 29938

Please send news for this column to: **Bob Franklin**, secretary, P.O. Box 1147, Brewster, MA 02631

Please send news for this column to: **Allan Q. Mowatt**, secretary, 715 N. Broadway, Apt. 257, Escondido, CA 92025

Doing some more backyard work, so to speak, I motored over to Arizona in May to see a few classmates. **Joseph Burns** and **Mary** welcomed me at their Sun City home as they were packing to return to Stamford, Conn., for the summer. Joe was Course XV and, after a few years with Abbott Merkt and Co., set up his own consulting business in materials handling, with clients such as UPS, Allied Stores, and others abroad. He and **Fletcher Thornton** might have some stories to swap about moving mountains of stuff. In World War II, Joe was a lieutenant in the Naval Air Transport, and in 1944 had the pleasure of being at the head table with **Charles Lindbergh** at a dinner. "Lindy" had test flown a British Meteor, the first Allied jet, and the admiral of the base threw a dinner in his honor.

Then on to Carefree, north of Phoenix. The May/June 1989 issue included a note from **George Trimble** about his building a miniature V-8 engine, and it is a beauty! Not a model but rather a working engine that will fire up when completed. George has machined every part—overhead cam shafts, valves, cylinders, the works—and I urged him to bring it to the 55th reunion so we all can admire it. "I always had a love for engines of any kind, and I took every course in them that the Institute offered," he told me. It continues to this day. His wife, Janet, told of his writing a series of articles for a new publication, *I C* (Internal Combustion), and also for a British journal. George's career was with Martin and NASA, designing for the XB-51 and the Apollo moon ventures, followed by ten years as CEO of Bunker-Ramo. Selected to get the company out of the doldrums, he said it took a few years to bring order out of the thicket. Success? And how! Substantial increases in earnings moved the market price of the stock from single to double digits and brought what one might call the ultimate compliment—a series of buyout attempts culminating in \$55 per share cash-on-the-barrelhead, which the stockholders couldn't refuse. George spoke of his friendship with **Dave Varner** and **Phil Ober** (deceased, 1979).

Farther north in Sedona, **Anthony Belser** greeted me in the home that he and his son built in 1979, except for plumbing and utilities. The work included raising a laminated ridgepole beam, which they did with shims and jacks. Tony joined our Course XV as a graduate student with an SB in industrial engineering from Lehigh University. All of his career was in finance—about 25 years with Price Waterhouse in St. Louis and Boston plus five more in Buenos Aires as a partner, then 12 years with United Geophysical Systems in Pasadena as comptroller and vice-president, finance. This February he returned to Buenos Aires with a travel group and renewed old acquaintanceships but found the economy foundering under inflation: Monday, 2,800 australs to the dollar; Friday, 3,900.

The last stop on this trip was at **Bob Boden's** home nearby in Sedona. Although we both lived at houses on Memorial Drive when at the Institute, we did not know each other. But we could now reminisce at length on the streetcar event, the Ford rebuilt in a bedroom, other well-known pranks, parties, and the exemplary conduct of Officer McGillicuddy of the MDC (or was it Cambridge?) Police when responding to a neighbor's

call for quietude. Bob came into the class as a graduate student with an SB from the University of Montana and spent four years with us getting his SM and PhD in physics. He followed this with two years on the staff working for Stark Draper, '26, so his Tech connections are many and strong. He spoke of **Ray Woodrow**, **Mal Holcombe**, **Bill Shockley**, **Harold Smyth**, **Ralph Johnson**, **Bill Mullen** and others (my scribbling could not keep up with his wealth of anecdotes).

Bob was and is a great problem solver. Ambulation has been difficult ever since a youthful accident, when he was struck in the heel with a loose baseball bat. This and ongoing arthritis, plus two hip replacements in 1971, leave him barely able to shuffle, and then only by bending way forward to avoid losing his balance. But you would never know it, sitting at dinner with him, upright and full of good tales and humor. He solved the mobility problem with two battery driven chairs and a Ford van with retractable lift. Using in part his own designs, this can be operated from outside or inside, with key-locks to thwart mischief makers. Of course, I offered to help, but all I could do was stand clear while he entered on wheels, shifted to a powered seat, and drove us to the restaurant. Bob had the support of his wife Mary until she suffered a massive stroke. She died in 1987, and after many trials he found a housekeeper with two small children who are a delight to him, and he to them. (More in next issue.)

I missed seeing **Luis Emilio** because he had returned to his California home at the end of March. There is a cluster of classmates around San Francisco, and some invitations to visit will have to be honored soon.

Ben Fogler, who retired from Arthur D. Little, Inc., in 1980, responded to the Chemical Engineering Department of MIT, giving his current address: 33 Woodland Rd., Rochester, MA 02770. He says, "My new wife, Madelyn, and I are enjoying travel, family genealogy research, our new home, and our summers at Mattapoisett, where we sail a 26-foot Seafarer." It seems that the class has enough sailors to hold a dinghy session on the Charles at our 55th. **Bob Gillette**, how about organizing one?

President **Alice Kimball** reports Technology Day luncheon attendance: **Ken Arnold** and **Pauline**, **Herb Borden** and **Kitty**, **Bob Caldwell** and **Sara**, **George Parkhurst** and **Barbie**, and **Ariel Thomas** and **Avis**. Also, **Ed Dashefsky**, **Tom Johnson**, and **Bill Metten** were registered for attendance at Pops or other events.

At this writing, our 55th reunion is just a year away, and when you read this column, it will be only eight months hence—a good time to reach out to others you would like to see once again in June 1991. Think of your associations in track, sailing, rowing, Walker staff, Commuters Club, etc. and use the class directory, which will be in the mail, to communicate and urge onward to Cambridge! **George Parkhurst** is handling the Cambridge affairs and accommodations and **Ken Arnold** those in Chatham on the Cape. Alice is coordinating the whole.

Cheers for the lives of **Paul Mulkern**, Course XV, and **Ray Svenson**, Course VI. Paul died suddenly February 19 of a brain tumor, but had been active at swimming, biking, and other activities right to the end. He had retired at age 68 following 30 years with Continental Can at Houston, Tampa, and Atlanta. During World War II, he was on the staff of the radiation lab at the Institute. His widow, Anne, told of his great pride in their two grandchildren: a girl, who is a "natural" for chemistry and is doing outstanding work in the field, and a grandson, now in graduate school to be a writer. Anne continues the residence at 125 Holly Tree Ln., Brandon, FL 33511.

A clipping from the *Middlesex News* of Framingham told of **Ray Svenson's** death last April 3 of a heart attack at the age of 80, one month short of a 50th wedding anniversary with wife Janet. In student days, he was active in freshman and varsity track and was secretary of the Commuters'

Club. Most of his career was in electrical engineering with Varian Associates in Beverly. I was unable to reach Janet by telephone, but apparently she continues at 29 Asylum St., Mendon, MA 01756.—**Frank L. Phillips**, secretary, 1105 Calle Catalina, Santa Fe, NM 87501; **James F. Patterson**, assistant secretary, 170 Broadway, Pleasantville, NY 10570

Richard H. Ewert of St. Paul, Minn., writes, "Retired as president of Sewall Gear Manufacturing Co. in St. Paul on December 31, 1988, and am now a consultant on factory cost systems for machine shops—marketing and gearing."

From Longboat Key, Fla., **Josiah Heal**, in touch with **Ralph Webster**, writes, "This fall (1989) has passed quickly and we're getting ready for Christmas. We're having our Christmas with two couples from Hingham, where I grew up. We're having our problems, as Marion has arthritis and Parkinson's. It's brought her walking down to a crawl, and she isn't able to write because her hand is too unsteady. We've got our fingers crossed about going north in June, which we enjoy due to the change of scenery. It does get beastly hot here in Florida in summer. Our place is on a lake in southern Maine—Acton (near Sanford). We're expecting our two children's families down in March, which will be fun. Our son is a captain for Northwest Airlines."

Nancy and **Joe Keithley** of Shaker Heights, Ohio, wrote to **Philip Peters**, our class president, saying, "We spent a restful two weeks in Florida during February. Joe had a meeting in Vancouver in June, and inasmuch as neither of us had ever visited that very beautiful city, we were happy for the opportunity to make the trip. Unfortunately, we did not take (or have time for) the spectacular train trip through the Rockies, as we wanted to spend time with good friends whom we rarely see. It was the high point of Nancy's year. Joe's principal 'spare' time activity continues to be writing a history of electrical and magnetic instrumentation for publication by the IEEE Instrumentation and Measurement Society. During the fall he made his usual swing to Europe, visiting Reading and the other Keithley European offices. He also visited museums in London, Munich, Milano, Lyon, and Paris researching and photographing material for his history. We wound up our year with a Thanksgiving celebration. Our three children, spouses, and two grandchildren were all together with us for the first time in three years—Betsy from California, Roy from Oklahoma, and Joe from Cleveland. It was a wonderful, exciting holiday."

Phil Peters reports he received Christmas notes from **Walter Wojtczak** and **Win Johns**. . . . **Wally** writes from Sarasota, Fla., "We are slowing down a little but are well. Going to California in March for son Rick's wedding (second) and in April we celebrate our fiftieth. Haven't decided what we'll do for it as yet. . . . From Palm Beach, Fla., **Win's** wife Alice writes, "Win is trying a little golf again after 11 months." We are delighted to learn he is doing well after his accident in New Orleans last year.

Sidney Mank of Washington, Va., writes, "Am busy with community work, involved with Lions, a convalescent aid organization, and work around the farm. Care of elderly relatives takes much of our time and all of our travel. We are in good health and love living in the foothills of the Blue Ridge Mountains of Virginia."

The **Klashmans**, **Peters**, and **Websters** spent a day in May with **Marge** and **Dick Young** in Newport, R.I., setting plans for our 55th (in 1992), part of which is to be our fun and relaxation in that mecca of sailing, tennis, golf, society life, and American history. The dates are June 1, 2, and 3 at Newport and June 4 and 5 in Cambridge. We plan to formalize around the 2nd and 3rd, with the 1st as a recommended option for those who want to move into it all gradually

and/or want more time to do things on their own, such as a round of golf with Dick at the Newport Country Club (where the first U.S. Open and U.S. Amateur tournaments were held in 1895). Keep the dates in mind and let nothing interfere. Remember the good time we had at the 50th.

I regret to report the deaths of **Ross E. Black**, **James M. Freiberg**, and **Edwin H. Place, Jr.** . . . Ross's widow Maria wrote that he died April 4 at age 74. He had been working on his journal for recertification as a quality control engineer with ASQC. The letter informing him of his recertification for another three years arrived a few days after his death. Maria writes, "My dear husband was an extremely knowledgeable gentleman and richly cultured in the true sense of the term. There are no words to describe my great loss. . . . **James M. Freiberg** (221 Glenview Rd., New Kensington, PA 15068) passed away December 31, 1984. . . . **Edwin H. Place, Jr.** (One Macomber Ridge, Marshfield, MA 02050) passed away August 21, 1989.—**Lester M. Klashman**, secretary, Brookhaven at Lexington, 307A, Lexington, MA 02173, (617) 862-4859

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Simply luxurious—that's the only way to describe MIT's Endicott House in Dedham, the scene of our 10th mini-reunion Friday, June 6. That afternoon and evening, 35 of us enjoyed the chateau, whose acres of gardens and grounds were never more beautiful. Half of us stayed the night and through mid-morning Saturday. Long-distance honors go to **Gretchen Birge** of Sunnevale, Calif. and **Connie and Harry Saunders** of Seattle, Wash. . . . Hilda was unable to accompany **Norm Bedford**, who had a cataract operation a couple of days before. As chairman and treasurer of Beckwith Elevator Co., Norm has turned over the presidency to his son, N. Clark Bedford. Norm is still active daily in the business of elevator installing, modernizing, and maintaining—a very competitive area in today's economy.

This reunion is the first the **Bruneaus** have missed. They sent greetings from the U.K., where they took in the world-famous Chelsea Flower Show. At the time of their note there had been no rain for the previous nine days—not exactly like this May in New England.

Our next notes should include a report from **Ed Hadley**, our assistant secretary. He and Jean sent their best wishes from Quito, Ecuador, where they had just heard the National Symphony concert on Independence Day. . . . **John Glacken**, though retired from the City of Cambridge for eight years, is still officially a resident. But that has not prevented his wintering these past three years at Bradenton Beach, Fla., and spending much of his summers at East Falmouth—both resorts at waterfront locations.

In response to an article in the *Boston Globe* on the debate over double hulls for oil-carrying tankers, **Lloyd Bergeson** responded that he had been incorrectly credited "with having supervised construction of the Quincy-built LNG ships in the late 1970s." He continued with "In the early 1970s, as general manager of the Quincy yard, I did conceive of the project to build proprietary 120,000-cubic meter LNGs. I also directed their engineering, design, and revamping of the yard to produce them. I selected the double-hull configuration combined with separate spherical containment tanks—after months of analyzing the alternatives—as the one that would provide the greatest protection to life, property, and the environment in the event of a grounding or collision. This protection was completely provided as planned when the LNG *Taurus* went aground in heavy weather off Tobato, Japan, in 1980.

Ellen has written to inform us that on May 4, **Russ Coile** had quadruple bypass surgery at Stanford University Hospital. In the course of it he was the subject of two research studies, one at the time of the angiogram to try to correlate stress and heart disease. The researcher couldn't

make him angry enough for it to register. (We in Course VI could have told them that ahead of time.) The second involved ultra-sound of the heart before and during surgery. He'd better get out of the hospital, for he is the "disaster coordinator" for the City of Pacific Grove. Because of the recent earthquake, there was a state-mandated earthquake readiness drill, which he planned for Pacific Grove and which was very successful. He intends to continue in the half-time assignment. Ellen adds that Russ has new vanity plates with the legend "MIT 38." Russ was recently contacted by someone writing a history on Van Bush. He had worked a year on Bush's Rapid Selector project. For the MIT Club of northern California, Russ organized an event to the Monterey Bay Aquarium Research Institute. MBARI expected a maximum of 30—finally allowed 60—and another 30 were turned away. We wish Russ a speedy and comfortable recovery.

Marie and **Paul O'Connell** have taken an Elderhostel program at the Grand Canyon. This April they visited Acapulco, took the *Pacific Princess* through the Panama Canal, and visited Aruba, Martinique, St. Thomas, and San Juan. . . . This year is a busy one for Ruth and **Frank Kemp**, with a month-long trip to Australia—seeing the large cities like our own, the small ones like Dodge City, and, of course, the Outback. Their son, Peter got an MBA from Wharton, and is soon to be married. By the time you see these notes, Ruth will be enjoying her 45th reunion at Furman University. . . . At the reunion we learned more about Eleanor Gardner's red carpet treatment in Istanbul at her alma mater, which we knew as Robert College. **Frank Gardner** is recovering from an eye operation we mentioned in previous notes, and is currently chairing a lake, forestry, and wildlife committee for the Grantham, N.H., community where they reside.

The traveling Hopgoods sandwiched our reunion between a forthcoming trip to Alaska and their recent MIT Quarter Century Club Danube trip. This latter started in Vienna and had stops at Bratislava, Budapest, Belgrade, Plevan, Bucharest, and then proceeded by ocean liner in the Black Sea to Istanbul. Needless to say they found the citizens in each of the involved Danube ports still euphoric about their newfound freedom. Hoppy was lavish in his praise of the down-river ship *Ukraina*, a Russian ship staffed entirely by Russians. Of the 21 different MIT parties aboard, two were of our class. Alice and **Roy Hopgood** and Hope and **Phil Sellers** (who plan to join us at the 55th if not before).

A family wedding prevented **Tice Boissevain** from joining us at Endicott House. He is in the final stages of publishing a book entitled *Physics of Sound and Harmony*. He adds that he has already entered 4,800 names of his family in his computer. Not being able to join us for the reunion, he sent along a reminiscence of how he came to be in our class. "On Saturday, July 13, 1935, I arrived in Hoboken, N.J., on board the *SS Statendam*. My ticket was bought from Rotterdam to Boston and included free passage on the night boat from New York to Boston. By the time I had been cleared by customs, it was too late to catch the boat. The only other free transportation was by Greyhound bus. I found a cab in Hoboken with a sturdy trunk rack to carry my Dutch steamer trunk. My combination violin-viola case and other suitcases went in somehow, as well as the special aluminum case with the rolled-up family tree I had meticulously copied for my brother Jan. I finally arrived at Park Street at 6 o'clock Sunday morning (a trip that today takes five hours took 12 hours in 1935). In Boston I found a cab with a running board and an ingenious driver, hungry for a fare. He rested the bottom of the trunk on the running board, securing the trunk with a rope through the open window. It took some doing to arouse the night watchman at 6:30 am but we finally got my big trunk stored in the basement, and I arranged for a dorm room so I could see the dean of Admissions the next

day. I then walked across the bridge to Boston, found a coffee shop for some breakfast, took a walk through the common and went to the Christian Science Mother Church. Next morning at 9:00 I walked into Dean Thresher's office at MIT. He greeted me warmly and asked what he could do for me. When I told him I had come to enroll as a student for the following academic year, he did a double-take and said: "I am sorry young man, but our enrollment closes in April. That is a firm rule." I told him this left two alternatives: (1) make an exception to the rule, or (2) change the rule because I had not come all the way to the United States to be stopped by a non-sensical rule. This must have caught him by surprise because he asked me to show him the papers of my schooling. He was familiar with the Dutch HBS (Hogere Burger School) high-school system and was impressed with my grades. Eventually he said: "You may consider yourself admitted, and I see no good need for an entrance exam." I filled out the registration forms, paid an admission fee, shook hands, and left for South Station where I boarded a sleeper for Detroit. I had the pleasure of meeting Dr. Thresher at our 20th reunion and I reminded him of our interview. He remembered it and said: "Oh yes, you are the determined young man who asked me to either change my stupid rule or make an exception. You know, we like determined people, particularly if they are also smart!"

Dave Wright wrote for a Doc Edgerton, '27, quote and brought us up to date on Betty and himself. You may recall that for years Dave, living in St. Louis, headed National Marine Services. In 1988 they became full-time Virginians. They now live on a farm 35 miles from Charlottesville, but he has a small office in town that he frequents several times a week. The farm operation consists of producing beef by buying calves, feeding them grass and a little corn, and selling them to feedlot operators in the Midwest. It loses money, but there is a lot of land on the place, and you can't just let the weeds take over. Another recent project is a tree nursery. On a four-acre tract they have planted several thousand small trees bought from growers from other parts of the country. Next spring he'll do the same on another four acres and repeat the process annually. The idea is that the trees in each block will be marketed to landscapers and municipalities beginning the third year and ending in the fourth. All he needs to do in the meantime is keep the trees growing and pruned, keep out deer and other animals, get rid of weeds and insects, and develop markets. Dave hasn't seen a boat or a classmate since 1988. Their son is a medical doctor in Burlington, Vt., and their daughter lives in Bethesda, Md., married to a young lawyer practicing inside the beltway.

Now the sad news. **Ben Siegel** died March 22 at Sarasota Memorial Hospital, Fla. Ben earned SB and PhD degrees from MIT in physical chemistry. Professionally he was associated with MIT, Cal Tech, and Weitzmann Institute of Science before joining Cornell University in 1949 to head its newly formed electron microscopy lab, from which he retired in 1986. He published hundreds of professional papers and a book, *Modern Developments in Electron Microscopy*.—**Don Severance**, secretary, 39 Hampshire Rd., Wellesley Hills, MA 02181; **Ed Hadley**, assistant secretary, 50 Spofford Rd., Boxford, MA 01921

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George Beesley reports to members of our 50th Reunion Committee: ". . . All the bills for 50th reunion are paid. Treasurer Joe Dana and many on the Institute staff did a wonderful job keeping track of things. Our class treasury has a balance of \$7,000 to apply toward our 55th." . . . **Fred Grant's** report (on volumetric basis) is attached. Two hundred fifty 50th reunion books were ordered. Major contributions to the book were made by **Fred Schaller**, **Joe Dana**, **George Beesley**, **Ernie**

Kaswell, and Institute staff. About 20 books are on hand, available on a first-come first-served basis to those who send \$39 per copy via check for "MIT Class of 1939," c/o Fred Grant, 22 Edmunds Road, Wellesley Hills, MA 02181."

Sid Silber and **Jean** traveled from Baltimore to become focal points of a '39er mini-reunion in Seattle during June. They came to attend horticultural society meetings in Seattle and see the famous Bchart Gardens near Victoria, B.C., and were visiting **Jim Barton** and **Mary** at their Lake Washington shoreside home. **Hilda** and **I** drove from Gig Harbor. **John Alexander** and **Nancy**, and **Hans Bebie** and **Austie**, arrived on Holden Withington and Betsy's 44-foot sailing yacht. After a delicious lunch at Bartons, the Withingtons treated us to a 3-hour cruise past hundreds of other beautiful homes along the lakeside.

Manning Morrill and **Connie** are traveling in Alaska and expect to stop over in Seattle before returning to Arlington, Mass. . . . **Paul Stanton** and **Dora** joined **George Dadakis** for dinner and reminisced about **Mike Herasimchuk's** successful quest to trace **Ben DeSimone**. **Paul** had been active in skeet shooting until his shoulder protested. His new hobby is croquet and thinking ahead about helping with our 55th class reunion.

Art Zeldin and **Helen** moved from Salt Lake City to Silver Spring, Md., where they combine golfing with chores of resettling. . . . My apology to Class President **Seymour Sheinkopf** and **Sylvia** for garbling a sentence about them in the May-June issue. It should have read: "Seymour Sheinkopf and **Sylvia**, in retirement, continue studies at the University of Maryland where Seymour is studying basic computer programming and **Sylvia** pharmacology."—**Hal Seykota**, secretary, 1701 Weatherswood Dr., NW, Gig Harbor, WA 98335

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The 50th reunion is now a part of the history of the class of 1940! And what a wonderful part it was! A total of 125 members of the class were registered for one or more of the events, and our class gift was the largest in modern history, exceeded only by that of the class of 1923. Of the 406 members in the MIT register of current classmates (there were 644 when we graduated in 1940), 307 contributed a total of \$5,916,664 to the Alumni Fund. Included in this total, 152 donors were matched by the Koch Challenge Fund, which contributed just over \$86,000. A special fund, in memory of **Dr. Schrade F. Radtke** and established by **Alfred C. Wu**, received almost \$44,500.

Events began Monday morning, June 4, when we gathered in Rockwell Cage, from where we headed the commencement march to Killian Court. Dressed in our red jackets and freshman ties as bands played and spectators applauded us. We joined our friends in a special seating area for the very impressive graduation exercises. Following a president's reception in nearby Eastman Court, we proceeded to Mystic, Conn., where we were joined by still more classmates for three days of camaraderie, renewing of old friendships, sightseeing, shopping, and special events. During the evening meals, we were provided with dance music of the thirties and forties from the vast tape collection of **Edward D. (Dan) Crosby**.

At our class meeting, a new slate of officers were elected for the next five years. **Norman R. Klivans** president, **Phelps A. Walker** first vice-president, **Martin A. Abkowitz** second vice-president, **Richard C. Babish** treasurer, and **Richard E. Gladstone** secretary. Following the election, **Sally (Mrs. Robert A.) Bittenbender** led a symposium for senior citizens.

Several class members spoke of some of their activities in their senior years. . . . **Robert V. Gould** told us of his adventures with his family on a flight to Alaska in their own small plane. . . . **Richard W. Cobean** started a two-year project of building his own airplane in 1979, and expects to complete it before the end of this year. . . . **M.**

Arnold Wight, Jr., has been very active in legislative affairs, and is currently a member of the National Energy Policy Strategy Committee. . . . **Joseph C. Jeffers, Jr.**, has studied local history, and has written books on the development of his area of Charleston, W. Va. . . . **Samuel P. Card** has had interesting experiences in his capacity as a mediator and arbitrator for the judicial courts of Florida. . . . **Charles M. Edwards** is still gainfully employed, with his family, in running a winery in Santa Rosa, Calif. . . . **William H. Hagenbuch** has become heavily involved in local conservation efforts.

Norman R. Klivans, with associates has established a special personnel service to place people for short-term positions, working largely with senior citizens. . . . **Oliver H. Fulton, Jr.**, has a most unusual hobby of collecting antique toys, many dating from his own childhood. . . . **William R. Stern** described his daughter's bicycle tour across the United States. . . . **Alvin Gutttag** discussed patents, and told us of how he uses his time while jogging to think of inventions, many of which he has had patented. . . . **Robert S. Harper** told us of his activities with SCORE (Service Corps of Retired Executives). Several other class members are also active SCORE participants. . . . **Franklin E. Penn** has helped as a local volunteer in Darien, Conn., and has served as chairman of the Planning and Zoning Commission. . . . **Walter B. Brewer, Jr.**, has made a study of antique cars, which he collects. . . . **Martin A. Abkowitz** is taking trombone and tennis lessons, and spends his spare time practicing both. . . . **Lee Hurley Bloom** does his part in community affairs by assisting in inner-city schools.

On Thursday, we returned to Cambridge for a reception for the class of 1940 by President Gray in his gracious home. We then had a class dinner at Symphony Hall, followed by Tech Night at the Boston Pops. The program included music from films of the thirties, as well as other selections from that period. Conductor **John Mauceri** asked our class to stand to the applause of the crowd. And we were indeed an impressive sight, presenting a sea of red jackets filling the whole front half of Symphony Hall. And what could have been more fitting than to be back there where we had participated in our graduation exercises 50 years ago! After the Pops, there was a get-together at McCormick Hall, for those who still had the stamina.

Friday morning began with a memorial service at the MIT Chapel. A listing of classmates who had passed away during the year included several on whom we have had no other information for this column. They were: **Charles T. Booth**, **James H. Brewster III**, **Billard F. Dowell**, **Alexander Hrennikoff**, **Stephen A. Kaufman**, and **Asher B. Robbins, Jr.**

Following a fascinating debate on the trustworthiness of the computer models used to predict the seriousness of the greenhouse effect, we participated in the Technology Day luncheon at the Athletic Center. Class gifts were announced, and then we all assembled outside of Kresge for a class picture. Dinner that evening was at the Museum of Fine Arts. Festivities wound down on Saturday with a "Techsas" barbecue and a "Boston—Made in Cambridge by MIT" bus tour.

A large vote of thanks goes to **Dick Babish** and his committee for a tremendous job of planning and organizing this outstanding event. Special mention must go to **Walter Helmreich** and **George Wolfe** for the marvelous yearbook they assembled. It is full of history and nostalgia, as well as specific information on many class members, along with pictures from graduation, the 25th reunion, and this reunion. In future columns, I shall include some quotes from the yearbook. And, of course, without the participation of many people in the Alumni/ae Association, the planning and executing of this week of special events would have been almost impossible. Retiring Treasurer **Edgar L. Bernard** has given gifts to many of these helpful people.

A major contribution to the class gift was made by **Barton L. Weller** to establish a professorship and research fund in a field that has not yet been established. **Bart** was looking forward with great anticipation to the reunion, but he met a tragic and most untimely death just two weeks earlier. His wife and several members of his family were present at the Technology Day luncheon to acknowledge the announcement by President Gray of the establishment of the professorship. Our deepest sympathy goes to **Bart's** entire family.

Among the replies to the reunion questionnaire was one from **Harold A. Chielek**, in which he writes, "Unfortunately, I will miss the fiftieth reunion. My wife and I will be traveling the length and breadth of Indonesia (i.e., from Bali to Java to Sumatra), as members of a delegation sponsored by the People to People Citizen Ambassador Program. The technical objectives of this delegation (being led by a professor from the University of Michigan) are to study the music of various major ethnic groups in Indonesia, and to exchange relevant information with personnel in their ministries, schools/conservatories, and performing groups. Since this is a once-in-a-lifetime opportunity which I could not miss, I will take a raincheck until 1995."

I welcome any comments that you may have regarding the reunion, or any of your activities. Please send them to—**Richard E. Gladstone**, secretary, 1208 Greendale Ave., Needham, MA 02192, (617) 449-2421

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Henry Auerbach died in January in Attleboro, Mass. **Henry** graduated from the MIT School of Architecture in 1941, after which he served on the Boston City Planning Board. During World War II he was a captain in the Army Corps of Engineers in the European and Pacific theaters. He graduated from Tufts Medical School in 1950 and took his residency at Rhode Island Hospital. He was a family physician until 1981. He was a member of the Murray Unitarian-Universalist Church, a sportsman, and a fine water color artist. **Henry** was the husband of **Martha Howe Auerbach**; he leaves three children and two grandchildren.

The 50th reunion committee—**Johan M. Andersen**, **David W. Howard**, **John F. Sexton**, **Ivor Collins**, **Mitchell J. Marcus**, **D. Reid Weedon**, **Joseph E. Dietzgen**, **Edward R. Marden**, **Leona R. Zarsky**—planned to meet during the summer to decide some of the important details affecting our 50th reunion which we hope you will attend.

Lewis T. Jester writes about sailing, a favorite activity of our class: "Navigated C & C 38 with a crew that placed third in class in the Huron-Mackinac Race, July 1989. Boat named *Solitude*, owned by **Joe Henry**. Planning to sail to Hawaii from San Diego in May with my brother **Mal** and two friends." . . . **Edith Corliss** writes, "**Charles** and **I** operate the Forest Hill Laboratory. I gave a paper at the Audio Engineering Society in October, 'The Ear as a Mechanism of Communication,' applying information theory to evaluate defects in hearing with hearing aids as well as in unaided hearing impairments. Saw **J. Gladis (Thompson) Provost** several times this summer. She now lives in Norway, Maine, doing art metal work commercially. **Charlie** now does more gardening than spectroscopy; his monograph (with **Bill Bozman**) on oscillator strengths for spectrum lines is justly famous."—**Joseph E. Dietzgen**, secretary, Box 790, Cotuit, MA 02635

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Virginia and **Floyd Lyon**, **Francine** and **Jim Stern** and **Alan Katzenstein** were at the reception for **Paul Gray** and for **David Saxon** at the Whitney Museum in New York. The **Katzensteins** had dinner with **Toni** and **John Cantlin** in Boston. **John** is thriving as a very busy retiree.

Bob Van Tuyle retired from the office of chairman and CEO of Beverly Enterprises in Pasadena, Calif. . . . **Russell W. Brown** is an adjunct professor at Virginia Polytechnic Institute and does some consulting. He sees **Don Kern** regularly and sees **Andrew Skinner** at meetings of the Naval Architects Society. . . . **Bert Clear** is on three industrial boards, two university boards, and one bank board. He sails, skis, golfs, and travels—recently to Rome, Florence and Paris on business, and to Utah, Jacksonville and Charleston otherwise. . . . **Jerry Coe** is “sailing, skiing and enjoying,” and he teaches business management at the University of Bridgeport.

Bill Denhard, our class treasurer, is a trustee of Phi Sigma Kappa and worked on the tax limitation campaign in Massachusetts. . . . **Bill Denen** is visiting scientist at Salem State College, does some consulting, and writes textbooks. . . . From **Fred Dierks**: “We’re getting older and lazy.” His comment, not mine! Fred does film and video editing, works with his computer and skis. **Walt Eberhard** lives in Sun City, Fla., keeping up with golf, tennis, square dancing, Lions Club and the Community Church.

Jack Flipse has been to Anchorage, Fairbanks, and other parts of Alaska as director of Texas A&M’s Offshore Technology Research Center Organization. . . . One more sailor and skier: Colonel **Dick Gibson** retired from the Air Force in 1967 and then was professor and chairman of the electrical engineering department at the University of Maine until 1980. He’s commodore of the Kollegwidgwock Yacht Club.—**Ken Rosett**, secretary, 191 Albemarle Rd., White Plains, NY 10605

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Jim Hoey is very good about sending along news items. From him comes an obituary notice for **John O’Meara, Sr.**, who died April 26 in St. Louis. After Army service in World War II, John worked as a metallurgist for American Brake Shoe Co. in St. Louis. He was later associated for many years with Banner Iron Works, serving as president from 1985 until his retirement in 1987. During his career John participated as a member and officer in several industry associations, wrote many articles on cast-metals technology and foundry management, and received numerous honors and awards. In the 1960s he served on the first air pollution control councils in St. Louis. John is survived by his wife Ricki, and four children.

Bert Picot reports from Holbrook, N.Y., that last November he underwent the installation of a heart pacemaker. Bert operates a photography business and has snapped pictures at several of our class reunions. . . . Early in May, I met **Jim Houser** at Tulsa’s 1990 International Science and Engineering Fair, where I was one of 1,000 judges looking at 750 exhibits, the cream of high school entries from around the world. Jim is long retired from Martin-Marietta and now lives in Maitland, Fla., where he has served four terms as mayor. He was in Tulsa observing our fair on behalf of the 1991 fair which will be held in Orlando.

Virgilio Barco, retiring president of Colombia, was the principal MIT commencement speaker in June. As part of the festivities, there was a high-security reception at the Colombian consulate in Boston. Among the invited guests were **Gene Eisenberg**, **Ralph Leader**, **Kemp Maples**, **Chris Matthew**, **Jim McDonough** and **Ken Warden**. Later that week, Chris and I attended a meeting of the Alumni/ae Association board of directors, where Chris assumed his duties as president. The amount of paper he inherited forced him to the Coop to purchase a new carrying bag. Marjorie Matthew and Ros McDonough joined us for several of the Technology Day activities Friday and Saturday. At the barbecue we sat at table with several young alums (’70 and later) who seemed awestruck by our great age and dignity. While waiting in Logan Airport for a return trip

home I observed three signs in noteworthy juxtaposition: “Men,” “Women,” “Lobsters.”—**Bob Rorschach**, secretary, 2544 S. Norfolk, Tulsa, OK 74114

44

The following item was printed inadvertently in the class of 1947 column in the July 1990 issue of TR. So, we hereby print it again within the correct class, thereby proving that **Bernard “Bay” Rabinowitz** is indeed still a loyal member of 1944. . . . Bay was recently appointed to the board of trustees of United Hospitals Medical Center in Newark, N.J. He is the creator and publisher of New Jersey’s newest weekly magazine, *New Jersey Focus*. It is inserted into the Sunday editions of nine of the state’s largest newspapers. Bay co-founded Atlantic Industry when he graduated from MIT and served as president and CEO of that company until 1987. In 1987, he pledged \$250,000 to MIT to support graduate students in MIT’s Technology and Policy Program. This program combines strong technical and scientific foundations with skills in dealing with social concerns. Bay’s commitment to public policy is obvious—he is chairman of the Commissioner’s Cardiac Service Committee, serves on the Citizen’s Commission for AIDs for New York and New Jersey, is on the advisory board of the Center for Technology at MIT, and is also on the St. Barnabas Burn Foundation Board.

Joe Lester, Jr. reports from Wilmington, Del., that his wife, Margaret (Clark), and he have been presenting skits for senior citizens’ groups about some of the country’s founders, e.g. Martha and George Washington, James and Dolley Madison, James and Elizabeth Monroe. They have written their own scripts and present the skits in costume.

Kay Adams Kulmala, retired in Carlisle, Mass., sends word that she joined celebrants from Eastern and Western Europe and Mexico for the 100th birthday symposium for Hannes Meyer, architect/planner (successor to Gropius/Bacchauer) in Dortmund, West Germany, last November. She used to work for Meyer during summer vacations in Mexico.

We regret to report that Professor **Lee Eagleton** who was with us in Bermuda on our 45th, passed away on May 15, 1990, at State College, Pa. His death was reported to us by **Norm Beecher**, a close classmate. Also, we sadly note the passing of **Robert Horn, Jr.** on June 8, 1990, at Concord, Mass. Both of our classmates will be missed. We extend our sympathy to their families.

Technology Day was well attended by ‘44. It was a stimulating day, one of the best in recent memory.—Co-secretaries: **Andrew Corry**, P.O. Box 310, W. Hyannisport, MA 02672; **Louis Demarkles**, 77 Circuit Ave., Hyannis, MA 02601

45

Seventy classmates, spouses and friends attended our 45th reunion last June 7-10—our hats are off to the reunion committee, particularly **Nancy and Charlie Hart** and **Jim “Money Bags” Pickel**. Yes, we had our usual Class of ‘45 rain on the Cape but not enough to dampen reunion activities.

Browsing and resting occupied Thursday afternoon, but many arrived promptly for cocktails and dinner at the MIT Museum prior to the Pops. We all, except for the **Tom Markeys**—sat together in our ‘45 seats, 1st balcony front left, ideal seats for us music lovers. Many attended Technology Day activities while others headed directly to New Seabury in Mashpee. Friday was a beautiful day, but it did rain as we set up square dancing following an outstanding clam-bake at the ocean’s edge.

Saturday we awoke to pea soup fog and the gnashing of teeth, but the 16 golfers who initially balked at the 1 p.m. tee times were delighted to

be able to play in the sun. In usual tradition our class meeting lasted all of 10 minutes. A reading of those classmates deceased since our last reunion plus the election of class officers as follows: president, **Chris Boland**; vice-president (New England), **Frank Gallagher**; vice-president (New York), **Jim Levitan**; vice-president (Midwest), **George McKewen**; vice-president (Southwest) **Jack Freiburger**; vice-president (West Coast), **Red Harrington**; vice-president (Pacific), **Sherry Ing**; secretary, **Clint Springer**; treasurer, **Jim Pickel**.

Our traditional class banquet was followed by **Charlie Patterson’s** annual trophy presentation (details later!), dancing and what-have-you. Sunday morning fog was thicker than Saturday’s. In fact, the 670-foot *Bermuda Star* was going aground off Falmouth as we ate breakfast. During the next several months, I shall provide you some insights on the activities of all reunion attendees, as I did indeed take notes for a change.

Suna and Art Hall were sailing from Maine to Key West, Fla., during reunion time. Art has put together some interesting thoughts about education, inflation, worldly problems, and the like. Some of his solutions are scary, but he feels that you will agree with them all by 1995. Best he stay at sea! . . . **Vince Butler** has been in and out of the hospital this past year with a heart flutter. It seems that his heartbeat gets out of synchronism and must be corrected by receiving electric shock measured in jewels. I am sure that you all remember that a jewel is an amp sec! . . . **Andy Maroochi** wrote in early May to advise that he would be unable to attend our reunion. The high point in his letter was to advise that wife Anne had finally, after 15 months of retirement, accepted the fact that Andy is underfoot!

In late April, I had a wonderful phone conversation with **Kirk Drumheller**, who was in Boston visiting his son who gave up on his PhD activities in computer sciences at the Institute only to take up opera singing at Boston University—and Kirk says he will make it! A daughter and three grandchildren live in the Washington, D.C. area. Hopefully we will see Mr. D. on his next trip East. Kirk retired about a year ago from a lifetime with Battelle Northwest and now lives in Seattle, where he is carrying forth solar thermal experimentation. . .

. **Walt Borden** has retired to St. Simon’s Island, Ga., where he falls off ladders like **Pete Hickey**. In addition, he keeps busy with Red Cross, Audubon, bird watching, fishing, shrimping, and various environmental efforts. I should add that Walter and Margaret spend two months in Europe this past spring. . . . **Bill Martin**, formerly of Johnson Controls and Darien, Conn., has retired to Williamsburg, Va., where he and Jeanne have a large house within sight of the James River and a golf course. Bill’s words of wisdom: retirement has many virtues, one of which is not having to say you’re sorry to irate customers! Bill states that the children number four plus spouses and nine grandchildren, spread from Kennebunk, Maine to Port Angeles, Wash. . . . Congratulations to **Paddy Wade** on her election as a life member of the MIT Corporation and to **Jim Levitan** on his election as a five-year term member of the Corporation. Don Severance, ‘30, recently forwarded an article from the *Boston Sunday Globe* (June 3) complete with pictures depicting our **Charlie Hart** as an archeologist. It seems that the Wayland, (Mass.), Archeology Group is uncovering artifacts that will be used to understand the native inhabitants of suburban Boston some 8,000 years ago. Yes, Charlie is deep in dirt and enjoying every ounce. No wonder his fingers looked funny at reunion. Don also indicates that Charlie and Nancy are outstanding country dancers; we certainly did not give them an opportunity to show their style at New Seabury.

Tilt! A few long overlooked items. **John Howkins** will not retire—he continues to work at Ingalls Shipbuilding in Pascagoula, Miss., after some 43 years. . . . **Freida Omansky Cohen**, one of our few architects, indicates that the only major event this past year was the birth of a 10th grandchild. . . . **Jim Pickel** continues full-time

teaching at Woodward School, a private secondary school just outside Boston. . . . **Kenneth C. Dessen** has been a faculty member at Columbia University's School of Dental and Oral Surgery since 1951. He is presently helping to develop a computer-assisted coaching program for teaching operative dentistry.

Donald M. Whitehead of Paxton, Mass., died last March 25. Don leaves his wife, Joan, a son, Curtis, of Chelmsford, Mass., and a daughter, Pamela, of Paxton. Don grew up in Worcester and spent his entire life in the area as a civil engineer. Initially, Don was with Ernest Whitehead, Inc. of Worcester and then Donald M. Whitehead Engineering Co. Don was a 35-year member of the Worcester Country Club. Yes, he was an avid golfer! Don also was a longtime breeder of Great Pyrenees dogs.

Benjamin L. Lemmer died in Naples, Fla., in September 1989. He had a 40-year career with General Motors in Buffalo, N.Y. Ben was with briefly as a Navy V-12er. Canisius College's School of Business Administration named him Businessman of 1970. . . . **B.W. Lutterberger, Jr.** of Lancaster, Pa., died July 17, 1989. . . . **Kenneth H. Fischback** died in Hanover, N.H., September 29, 1989. Ken, who received a PhD from the University of Pennsylvania, was a pioneer in ink-jet technology and served as mentor to the field throughout the world. He held 38 patents in the field of electronic printing and was founder and chief technical officer of Spectra, Inc., in Etna, N.H.—**Clinton H. Springer**, secretary, P.O. Box 288, New Castle, NH 03854

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Alas, not a stitch of news from classmates here on a blistering Denver afternoon at the end of June. About all I can offer are some notes on a couple of V-12 lads who probably think I've ignored them all these years. Sorry this is so, but I haven't forgotten them.

Seems to me **John Wandrisco** was in the same company I was, on "the fifth deck" of the Grad House. He doesn't say where he was sent by the Navy after graduation, but does mention picking up an MBA at Harvard. He lingered in New England long enough to marry Ginnie in 1950 before leaving Connecticut and returning to Latrobe, Pa., not far from where he grew up in Pittsburgh. He's been with Latrobe Steel ever since, traveling a lot outside the USA in his first 16 years developing international licensees and affiliates. At last word he was general manager of marketing. They've raised three girls—all married—and a son who's following in his dad's footsteps by becoming a mechanical engineer (from Penn State). John and Ginnie enjoy a full life of outdoor activities from gardening/farming to skiing and fishing. Bless their bones for finding Colorado as their favorite vacation place.

Then there's **Bob White**, another Course II grad, who grew up in Newtonville, Mass., and married Barbara, a Simmons belle, on our graduation day February 25. Bob started out with G.E. in Lynn but soon migrated west through Pennsylvania to Indiana, where they now live in Crown Point. Bob runs his own White Engineering Associates, which designs and builds refuse conveyers and energy recovery systems. They've raised three engineers and two mathematicians with nine degrees between them (three boys, two girls). Bob volunteers as a Presbyterian elder, in the Kiwanis, and with Boy Scouts, and enjoys bicycling, downhill skiing, and sailing. Looking toward retirement—if he hasn't retired already—they'll move to their house in Harpswell, Maine. And where might that be, Bob?—**Jim Ray**, secretary, 2520 S. Ivanhoe Pl., Denver, CO 80222

47

Dick O'Donnell sends us a note along with some fascinating clippings from his local

newspaper this month. Dick spent 35 years with Ingersoll-Rand and retired in 1982. At that time, he was vice-president of sales for the Middle East, Europe, and Africa, residing in London. Upon retirement, Dick moved to Hilton Head Island, S.C. He is a past president of the Palmetto Dunes Resort homeowners' association and has been on the town's Shoreline Protection Task Group. Recently, he was appointed to the town's planning commission.

This group is in charge of preparing and updating the island's comprehensive plan, which includes monitoring the rate-of-growth system, water and sewer systems, marshes, roads, and emergency evacuation.

For the last six years, though, Dick has been deeply involved in plans to save and rebuild ("nourish") the island's beaches. He sent us a long article on the engineering study and process, which we wish we could print. Perhaps, Dick, you might think about submitting it to *Technology Review* for possible publication. In any event, the work is now in progress, with a \$9 million project to nourish some seven miles of beach. Dick says it's half done and looks great. And now he hopes he can find time to start working on his golf game again!

Lena "Sutera" Norman writes from Saginaw, Tex. She recently retired from her work as a draftsman for Menasco Aerospace where she worked on landing gear design. Now she has more time to devote to her art and sculpture. Lena attended the 40th reunion in 1987—her first visit to Cambridge since 1946! She would like to correspond with other classmates.

Claude Brenner sends us a number of brief news items: **Al Steinmayer** recently retired from GE's Aerospace Division—and says he's tried working and retirement and retirement is better! **Al** says **Dick Wentink** retired as chief engineer of General Dynamics Convair in San Diego and is living in LaJolla. . . . **Ted Garber** is still working—at TRW in Redondo Beach, Calif. News about Claude: he was recently elected president of the board of directors of MIT Hillel Foundation, Inc.

Harold Salwen sends news about one of our "missing classmates" and promises to write again to tell us news about himself. But we haven't got that letter yet. Harold is professor of physics at Stevens Institute of Technology in Hoboken, N.J.

. . . **Bob Seidler** writes to tell us to take his name off the "missing classmates" list—he's living in Westlake Village, Calif., and hopes to attend the 45th in 1992.

A press release from the American Academy of Arts and Sciences advises that **Paul Cook** was elected a fellow this year. The academy was founded in 1780 by John Adams and others as an international honorary society in the arts and sciences. Among its current membership of over 3,000 scientists, artists, businessmen, and public figures, it counts 148 Nobel Laureates and 58 Pulitzer Prize winners.

We received a delayed notice that **Dubash Soli** died in 1987. We also received a letter from his daughter, Anneke Dubash. She is writing a biography of her father and would like to have any information that his classmates might provide on his days at MIT. If any readers can help, her address is 475 Elgin St., Apt. 1512, Ottawa, Ontario, Canada K2P 2E6.

Send news!—**Robert E. McBride**, secretary, 1511 E. Northcrest Dr., Highlands Ranch, CO 80126

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The classes of '47, '48, and '49 had cocktails in June before Tech Night at the Pops. Our class was represented by Gloria and Sonny Monosson, Virginia and George Clifford, Bill Katz, Nancy and Don Noble, Ben Brettler, Jean and Milton Slade, Tel and Bob Sandman, Bob Manz, Jackie and Leon Brettler, and your truly. MIT has completed reconstruction of the Stratton Student Center. A large room in the center with a view of

Kresge Auditorium and the playing fields was the site of our gathering. Hot and cold hors d'oeuvres included lightly braised scallops and beef teriyaki cooked to order. After sampling fruits, vegetables, cheeses, pizza slices, and egg rolls, everyone cancelled plans to have dinner after the cocktail period. Only one or two classmates had plans to attend Tech Night at the Pops, allowing us to chat for 45 minutes after the planned closing.

I had brought flyers describing the Harborview Hotel in Martha's Vineyard. We reviewed our plans for a joint reunion in September 1991 with the other classes. Most attendees expressed interest in attending the reunion.

At the Alumni Luncheon the next day, **David Vigoda**, **Harold Attobrine**, **Bob Ormiston**, **Al Seville**, and **Jack Walch** joined us to cheer the reunion classes for their gifts. We had a lively discussion about the morning program, which presented opposing views about the potential impact of global warming due to the greenhouse effect. Personally, I side with the economics professor who said the only actions that should be taken now should be actions that are justified for significant reasons in addition to their potential impact on global warming. He felt there was insufficient proof to support expending money and effort for actions based only on the proposition that the proposed action could prevent global warming.

Don Noble has sold energy conservation systems to five large commercial office buildings. The systems make ice at night (off-peak power) and use the ice to provide cooling during the day. The total installed size of the five systems is equivalent to 5,000 tons of refrigeration capacity. Don also sells energy management systems using electronic controls for installation in large commercial buildings. Don and Nancy's daughter, Stacy, has completed two years of medical school at Georgetown. After taking medical board exams, Stacy will spend the next two years on hospital service rotations. Lynn, a young Vietnamese woman, who lived with Don and Nancy during her high school years, is now a senior at UMass.

Leon Brettler operates a family owned music publication business. Since Leon joined the firm in 1956, they have published a complete spectrum of music, and today the emphasis is on pop music. Leon's wife, Jackie, is vice-president and treasurer of the company. Jackie listens to all the music that comes into the company. Leon spearheads the creative effort of the company, which includes picking out which new music to publish and finding ways to have old songs recorded again.

Leon has worked to simplify what he learned in Course XV to make sure that more money comes in than goes out. Leon and Jackie have two sons, and Michael is a vice-president of the business. In the industry, Michael is Mr. Brettler, and Leon is called Leon. If among our classmates or their families there is a major recording artist signed to a major recording studio, Leon asks you to call him collect any time day or night. Leon is a vice-president of ASCAP representing 12 publishers, and Sammy Kahn, SM, '47, is a vice-president of ASCAP representing 12 writers. Morton Gould, the conductor, is president of ASCAP. Leon is also a vice-president of the National Music Publisher's Association.

Leon and Jackie live in Scarsdale, N.Y., and travel extensively, sometimes together but not always. They have relationships with subpublishers on every other continent. Since the export of music is a contributor to reducing the national balance of trade deficit, Leon has lobbied our Congress for laws to encourage exporting music.

Donald Towse has retired from University of California's Lawrence Livermore National Laboratory, where he was senior staff geologist for the last 16 years. He will continue personal research studies at the laboratory, where he has been appointed a participating guest. Don intends to expand his consulting practice and to continue as

managing director of the nonprofit Delta Research Institute. Don is president of the Energy Minerals Division of the American Association of Petroleum Geologists. Don has studied disposal of nuclear wastes. Before joining the laboratory, he managed international mineral and energy projects for Kaiser companies and held posts in the oil industry and at several universities.

Bob Ormiston is teaching science to liberal arts students at a community college. He finds it rewarding to help them learn science, but it is a constant challenge to find ways to communicate scientific principles to a new audience. Bob purchased a gas-fired boiler and installed it in his home to increase the efficiency of burning fuel and to replace an outmoded electrical heating system. . . . **Jack Walch** is working to improve the distribution of electrical power by his company. He continues as an active volunteer at his church and other community activities. . . **David Vigoda** played tennis during a winter visit to Florida. . . . **Ben Brettler** is a lawyer with a firm that is closely involved with over 20 family owned businesses. Ben provides a wide spectrum of services to his clients.

Dick Snow has retired from Eaton Corp., Golf Grip Division in Laurinburg, N.C. Dick had been their chief chemist for the past 10 years. Previously, he was director of technical services for Manning Corp. in St. Pauls, N.C., for eight years and technical manager of B.F. Goodrich Footwear Division, Lumberton, N.C., for 23 years. . . . **Curtis Green** and his wife, Joan, live in Tulsa, Okla., and have been major supporters of several Jewish organizations in Tulsa in addition to supporting their own synagogue. Curtis writes about the three prominent events in his life between 1983 and 1988. Two of the events were happy—the marriages of two of their four daughters. The third event was on the bittersweet side—the collapse of energy prices and the end of the domestic oil business as Curtis had known it. It was necessary for Curtis to lay off close to half the work force of a small organization that took years to build, but there is even a good side to a bad business climate. Curtis rarely works a full day anymore (mostly because there is nothing to do) which in turn has given him more opportunity to play quite a bit of golf.

Gil Rohleder also lives in Tulsa, Okla. Gil retired from MAPCO in 1986 after serving as president and chief operating officer. He spent 26 years with MAPCO including a long period as executive vice-president prior to being president. Gil and his wife, Patricia Jane, have four children and five grandchildren.—**Marty Billett**, secretary and president, 16 Greenwood Ave., Barrington, RI 02806, (401) 245-8963

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In a letter dated June 7, **Marvin Zimmerman** describes the search he and his wife Inez made to locate our classmate **Georges Diligenti** in France. "Starting with the address from an old letter we had received in 1968, Inez, by superb detective work, tracked Georges to Villeneuve-sur-Lot in southwestern France. The trail first led to Colomiers, about 20 kilometers west of Toulouse. There, in the town hall of records (the Mairie), we learned that Geroge might be found in the town of Levisnac, 15 kilometers farther to the west northwest. We drove to Levisnac where, after a false start and rechecking with the local post office, we located the estate and/or chateau—le Prone—which Georges had farmed for many years. Georges, however, was not there. Later we learned he had retired about a year ago and was living elsewhere. Fortunately, a stonemason who was repairing one of the buildings gave us a phone number where Georges could be reached. We returned to the town center and Inez called the number. The person who answered was Georges."

Georges is the father of nine daughters and one son, has 10 grandsons and one granddaughter.

One of his daughters was being married the following Saturday in the Basilica of St. Sernin in Toulouse. Marvin continues: "Georges asked if I knew what became of his roommate in the dorms at MIT. Unfortunately, I do not remember the roommate's name. However, if you publish this letter in the class notes, Georges' address is: Georges B. Diligenti, le Prone, Levisnac, Haute Garonne, France. Georges would especially like to hear from former friends and roommates. (Secretary's note: Georges and I served together on the Student Staff at Walker and I remember him vividly. The Alumni/ae Association now has his current address and it is my hope that Georges will see these notes in the October issue.)

In a clipping of unknown date from what I believe is a prestigious publication (though the name is not given), we have news of an honor bestowed upon **Ira Dyer**. In the article, Professor John M. Deutch, provost, announces the choice of Dr. Ira Dyer to be the first holder of the Weber-Shaughness Professorship—a chair established by the late Professor Harold C. Weber (Course X) and his wife. Prior to his distinguished and colorful career, Ira received three degrees from MIT: an SB in 1949, an SM in 1951, and a PhD in 1954.

Highlights of Ira's career include the following: As a vice-president of Bolt, Beranek and Newman, Inc. (the well-known acoustics consulting firm), he founded and directed the Cambridge company's Program for Advanced Study and its largest department, the Physical Sciences Division. (Secretary's note: During this period, in 1964, the class of '49 celebrated its 15th reunion at a hotel down on the Cape. In the spirit of cooperation for which he has always been noted, Ira brought an acoustical cannon for the purpose of bringing the short business meeting to order. Whether the cannon had anything to do with it or not, it was rumored at the time that the management had decided not to invite us back.)

In 1970, Ira returned to the Institute, where he became head of the Department of Ocean Engineering. Ira is a fellow, past president, and Biennial awardee of the Acoustical Society of America. He was elected to the National Academy of Engineering in 1976.

I am saddened to report that **David DuBose Gaillard II**, a private investment manager, was killed instantly in an automobile accident in the Washington, D.C., area on Sunday, June 3. Dave was a world-class racer of Star Boats in the Chesapeake Bay Yacht Racing Association and also an ardent devotee of Dixieland jazz. In a sad coincidence, according to his wife Barbara, with whom I just spoke (June 28), today was the Gaillard's 43rd wedding anniversary. Dave's grandfather, after whom he was named, was the engineer for the Panama Canal. In 1913, the 8-mile-long, 500-foot-wide Culebra Cut was renamed the Gaillard Cut in honor of the engineer in charge of digging it. Survivors include his wife, Barbara Stanton, and four children: David D. IV of Hardwick, Vt. (David D. III died in infancy); Peter S. of Potomac, Md.; Annie of East Hardwick, Vt.; and Helen Gaillard-Wheelock of Chattanooga, Tenn. Also his mother Mona B., sister Monica G. Peck, and four grandchildren. Dave was 65 years old. Speaking for the class, I extend our deep condolences to Barbara and the rest of the family.—**Fletcher Eaton**, secretary, 42 Perry Dr., Needham, MA 02192, (617) 449-1614

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Please send news for this column to: **John T. McKenna**, secretary, 182 Midpine Rd., P.O. Box 376, Cummaquid, MA 02637-0376

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On June 10, Class President and Gift Committee Co-chairman **Bill Maini** and his gracious wife Maria hosted a gathering of our 40th Reunion

Gift Committee members at their Falmouth home. Various reports on the status of the committee's work were given by Bill, Co-chairman **Varv Grossman**, **Tom Kelly**, and **Fred Lehmann**. Our goal of \$5.1 million is attainable, but extra effort by all our class will be required if we are to succeed. Our class's special Fund for Excellence in Education will be used to recognize excellence in teaching at MIT. Please be sure to designate the "Class of '51 Fund for Excellence in Education" when you send in your donations or pledges to MIT. Since your pledges for the next five years will be credited to our class goal for the 40th year, please remember to include a pledge covering your next five years of giving.

At the gathering, Reunion Chairman **Harold Glenzel** outlined the plans for Alumni Day and for the Chatham Bars weekend. By the time you read this you should have received the initial information package on the reunion. There will be a form to complete providing information about yourself to appear on your page of a class book that will be distributed. Please be sure to fill out and return this form including a current photograph. We want to be sure you are represented in the book even if you are unable to make the reunion. This new feature has proved to be very popular with the most recent reunion classes.

Traditionally, the 40th reunion has a very high percentage of the class present. Don't be left out. It promises to be a great deal of fun, fellowship, fantastic functions, and food.

Attending the Falmouth meeting were **Mona** and **Fred Bumpus**, **Ginny** and **Bill Cavanaugh**, **Lois** and **Harold Glenzel**, **Bobbie** and **Marty Greenfield**, **Joanne** and **Marv Grossman**, **Donna** and **Chuck Hieken**, **Ellie** and **Howie Livingston**, **Carole** and **Dick Reedy**, along with our hosts, **Maria** and **Bill Maini**.

Your class secretary proudly announces the wedding of his daughter **Carole** to **Tom Gulick** on June 30, 1990. **Carole**, a graduate of Brown University, is a manager at the Digital Equipment Corp. Her husband is an engineer who also is at DEC. Other good news is that our oldest daughter **Leslie**, a manager at Hewlett Packard, will be presenting us with our first grandchild in August. I am still working at what was the Information Systems division of Honeywell, although its name and ownership has changed to Bull HN.

Our class can boast of a notable artist in **Rich Ahern**. Rich, who lives in Ann Arbor, Mich., recently presented his latest acrylic painting at a meeting of the selectman in Marblehead, Mass. His work, "The Old Town House, Marblehead," provides a unique panorama that combines a view of the area with a span of history. Seen chatting are figures of Marblehead's signer of the Declaration of Independence, Judge Joseph Story, who was Marblehead's appointee to the Supreme Court, and President Andrew Jackson. A few yards from these gentlemen a hotshot skateboarder and a modern-day executive are passing by. Rich is an avid world-peace advocate who would like to see the open town meeting form of government revitalized across the country. He feels that people are often denied the full truth about their government and world affairs, which could be remedied by more open discussion of the issues at a local level.—**Martin N. Greenfield**, secretary, 25 Darrell Dr., Randolph, MA 02368

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Our class has lost two graduates of Course II. **George Henry** died a year ago, May 23, 1989. He was a resident of Norwell, Mass., and is survived by his wife, Anne. . . . **William B. Smith**, age 61, died last April 21, at his summer home in Brewster, Mass. He also had a home in Winston-Salem. He transferred to MIT from Ohio Wesleyan and, after graduation, served in the army designing amphibious trucks. He later worked for Chrysler and Walter Motor Truck Co. He became chief engineer for Autocar, a senior vice-president for White Motor Corp., and then senior vice-

president for engineering and advanced product development at Freightliner. Most recently, he was a consultant for Daimler-Benz. He had also been involved in studies of fuel economy and safety with the Society of Automotive Engineers and was recently named a fellow. He is survived by his wife Jeanette, four children, and three grandchildren.—**Richard F. Lacey**, secretary, 2340 Cowper St., Palo Alto, CA 94301

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The items are rather limited this month, so I'll get right with it. **James Sullivan** reports from Westport, Conn., that he has retired from IBM and is now teaching and consulting. . . . **Edward Kingsbury** has been appointed to the Fellows Committee of the Society of Tribologists and Lubrication Engineers (STLE).

Dick Simmons of Allegheny Ludlum Corp. is in the news again. He is stepping down from the position of president and CEO but will continue as chairman of the board and chairman of the board of directors. In these roles, he will concentrate on Allegheny Ludlum's strategic directions, acquisitions, and management succession. His replacement as CEO, who has worked closely with him, said, "Dick Simmons has had an outstanding career in the specialty materials business as a technologist, trade spokesman, and industry leader. His leadership of Allegheny Ludlum has created one of the world's foremost specialty steel producers with an exciting performance record and a focus on the future that holds great promise."

And finally, Patricia Aubruner has advised MIT that her husband, **William G. Aubruner, Jr.** passed away on February 20, 1990. Our heartfelt sympathy goes to her.

The limited number of items this month is an indicator that you all are not passing along word of your activities, plans, and honors in a timely manner. If I don't get some more items soon, I'll be forced to report at length about my son's move to Hawaii with his wife, a government geologist, who will be studying volcanoes for the next three years. Son Patrick, who has been specializing in environmental law, will be expanding his legal horizons to public law.

Until next time, please note the address below for your doings and happenings.—**Gilbert "Gil" Gardner**, secretary, 1200 Trinity Dr., Alexandria, VA 22314, (703) 461-0331

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Word has been received that **Peter Rigopoulos**, formerly president of Amicon Corp., (a subsidiary of W.R. Grace Co.) is now vice-president of Grace Specialty Chemicals. As a result, he now works in Beverly, Mass., rather than in Danvers. . . . During the spring, **Paul Gray** was appointed to the Manufacturing Forum, a new standing committee established by the National Academy of Engineering and the National Academy of Sciences to assess public policies and programs and private-sector actions affecting U.S. manufacturing performance. . . . About a year ago, we reported that **Angelo Molinaro** had published a book proposing a new theory of the universe. At the time, we did not even know the name of the book. It is titled *The Two State Universe*, and was produced by the Branden Publishing Co. According to a review in "The Bookwatch," both physics majors and general scientific readers will find the new theory to be fascinating reading.

Take a minute this fall to drop a line about your latest activities.—**Edwin G. Eigel, Jr.**, secretary, 33 Pepperbush Ln., Fairfield, CT 06430

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Although by the time you read this, our 35th reunion will seem like a long time ago to the lucky

bunch who attended, our deadlines are such that memories of that happy event are still fresh in the minds of your new co-secretaries who now have the honor of preparing this column. Our first official act is to give the class's and our own heartfelt thanks to our outgoing co-secretaries, **Bob Greene** and **DuWayne Peterson** for their stellar performance during these past eventful five years. During this time, by my calculations, they haven't missed an issue (well, hardly) and all have been interesting and eminently readable, even during the long dry spells between Technology Days when the news flows more abundantly. Your new co-secretaries, listed below, will try valiantly to keep up the good record, but, Bob and DuWayne, you are a hard act to follow.

To summarize, the 35th reunion at Technology Day and at the lovely Wequasset Inn in Chatham, Cape Cod, was a huge success, in spite of the uncooperative weather. Tremendous thanks for this are due to our reunion co-chairmen, **Bob Greene** (there he goes again!) and **Joe Saliba**, along with the supporting cast of the reunion committee and class officers.

One significant accomplishment was the election of new class officers, after a not-too-hard-fought campaign (but no doubt grueling negotiations in the back room). Our new class president is **Ed Ehrlich**, replacing **Paul Attridge**; two new vice-presidents are **Bob Greene** and **Joe Saliba**; the new treasurer is **Paul Attridge**, replacing **Ed Ehrlich** (begin to get the picture?), with **Ed** helping with the transition as assistant treasurer; **Peter "Pete" Toohy** continuing as our erstwhile class agent, and yours truly as co-secretaries. So, you can see that there will be some veteran help at the reins but with a bit of new blood to keep things fresh and honest.

A brief chronology of events for those who couldn't make it, or for those who did but whose aging minds may have forgotten already. After a nice reception and excellent dinner at the Faculty Club, where many acquaintances were remade, we were bussed to the traditional Tech Night at the Pops, which was as rousing and fun as always. Friday morning, Technology Day, saw many of us getting our brain cells stimulated with erudite lectures and debates on the global climate change, the massive but still amazingly tasty Technology Day luncheon in the Athletic Center, and the impressive class gift presentations. In the afternoon, we were bussed or made our own way to the Wequasset Inn, on the shore of Pleasant Bay, where we had another pleasant reception and a fabulous clambake with lobster and all the trimmings. **Joe Saliba** reported on the reunion questionnaire, organized by committee member **Gil Davidson**. We'll give some highlights of that later, when the fresh news runs out. Joe also awarded some highly innovative prizes for class members distinguished by various superlatives. The hands-down winner was **Alfonso Morcillo Dosman**, who claimed prizes for longest distance traveled (from Colombia), most grandchildren, and oldest grandchild. Alfonso also moved us all with a heartfelt plea for doing our own part to help stop the drug trafficking by working to stop the consuming side of the equation, while many of his brave countrymen work to stop the supply side.

The evening was capped by a hastily regrouped and rehearsed subset of the famous Logarithms, who gave several slightly rusty, but still recognizable and highly entertaining renditions of the old favorite barbershop style songs we all loved in 1955.

Saturday allowed us to mostly "do our own thing." Some went whale-seeking (whale-watching is a little too generous) out of Provincetown, some played slightly soggy tennis, some tried to restrain their spouses from overdoing the shopping in Chatham and environs, some simply sightsaw, and a couple of adventurous souls went sailing on Pleasant Bay. The evening saw yet another lavish reception and dinner followed by a terrific dance and jazz concert given by the Intermission Trio, led by MIT's Associate Provost, Jay

Keyser. Along with Jay, on trombone, were the famous Herb Pomeroy on trumpet, John LaPorta on reeds, Tony Hannon on drums, William Youngren on piano, and Robert Nieske on bass. An incredible treat!

Sunday, we wound down with a leisurely brunch, followed by a most stimulating talk by **DuWayne Peterson** on his experiences with the search committee in their (now thankfully completed) difficult quest for a successor for Paul Gray. '54 DuWayne illuminated us all with the many profound considerations that must go into selecting someone for such a demanding post.

So, after farewells, we are all looking forward to our next, the 40th, and hope to see many more of you there. For any skeptics among you, it really was fun and not at all the one-upmanship game or bore that you might envision. The millionaires (if any) mingled easily with those of us still struggling to make a living, and a good time was had by all. Do come next time!

We are (wisely) constrained by the *Review* from listing all of the attendees and want to hoard most of the notes received from the attendees to dribble out over the next few issues. A few notes from the non-attendees, however, seem to be in order: **George Goepfert** writes that he is continuing to enjoy life as a private petroleum consultant. His wife, Patti, and he have been doing a lot of traveling—Indonesia and Australia last year, France this year. George and Patti are living in Houston. . . . **Gilbert Strang**, professor of Mathematics at MIT, continues to pour out textbooks and articles on the effective teaching of mathematics. His latest, *Sums and Differences vs. Integrals and Derivatives*, published in the *College Mathematics Journal*. Maybe we would have understood it all, Gil, if we had had your clear way of explaining the fundamentals!

There are more personal notes from classmates responding to the reunion mailings for which we don't have space in this issue. Besides, I need to save some for my co-secretary to report in the next issue. But let's keep hearing from you!—co-secretaries: **Roy M. Salzman**, 481 Curve St., Carlisle, MA 01741; **James H. Eacker**, 3619 Folly Qualter Rd., Elliott City, MD 21043

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This is a reminder that the 35th class reunion is scheduled for September 1991 on campus at MIT.

Theo A. de Winter is seeking election to the U.S. Senate from New Hampshire. He is a professor of manufacturing engineering at Boston University, a graduate of Bowdoin and MIT, and has been active in Greenville since 1982 on the finance committee and the public library. Ted feels there is a dearth of technical and analytical talent in Congress, which he intends to address. He had a meeting with President Gray, '54, which proved useful. Ted would like your comments, info, questions, and I am sure support in networking. The BU telephone number is (617) 353-9893. He has been noted for an open door policy to his students, has worked in the field of superconductivity in design, production, marketing, sales, and as a co-founder of a firm in this area. He hopes to be able to address state, national, and international issues based on personal, professional, and educational background.

Fred Culick's daughter, Lisa, received a good-sized spread in the L.A. Business Section of the *Star News* ("Like Father, Like Daughter, Helping Girls Reach Goals for Equality"). Lisa graduated from Wellesley, has a master's from UCLA, and plans to enter law at Northeastern. Fred is a professor at Caltech.

A secretary's apologies to **Craig Sherbrooke** for misspelling his name in the May/June column. (Maybe I spent too much time in Vermont, or it could be the subliminal revenge of a Townie on the Hill.)—co-secretaries: **George H. Brattin**, 39 Bartlet St., Andover, MA 01810, (508) 470-2730; **Irwin Gross**, McGraw-Hill, 1221 Ave. of the Americas, New York, NY 10020, (212) 512-3181

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Please send for this column to: **John Christian**, secretary, 23 Fredana Rd., Waban, MA 02168

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Our on-the-go West Coast correspondent, **Toni Schuman**, writes, "I attended Technology Day this year for the first time and was really impressed. I've been on the board of directors of the Alumni/ae Association for almost a year and have enjoyed the honor enormously. And, as an added benefit, I get to Boston four times a year. I saw several of our classmates, including **Glen Strehle**, who worked the whole time—very successfully, based on reports of contributions to the Alumni Fund. I sat with **Marty O'Donnell** and **Liz Drake** at lunch. Marty is a partner in a large law firm, doing patent law. His three kids are all away at school, and he and Louise are enjoying being empty nesters for a while. One daughter is at Princeton, another at Exeter, and their son is at Haverford. Liz is doing consulting work for major chemical companies, having left A.D. Little where she was a vice-president. She is also a director of the ASChe.

"I am still with TRW and seem to spend most of my time in airplanes. With peace breaking out, some of us in the defense business are trying to figure out how to make plowshares. It's a wonderful challenge. My son, Eric, graduated from UCSB in environmental science, and my daughter, Jennifer, is an architect doing exotic research into energy efficient buildings."

Robert De Jong writes: "After 30 years spent working in Europe, we moved to Appleton, Wis., where I started working for James River Corp. in their secondary fiber pulp division. Previously, I was laboratory manager for Papinfabrik in the Netherlands. . . . Out on Nantucket Island, **Carl Borchert** has been serving as works manager for the construction of the town's new high school building. Carl and his wife, Karen, have lived on the island since 1969, and he is a self-employed builder and engineer. He has also served as a building inspector and is currently a candidate for the board of selectmen. . . . **Raymond Patten**, head of the Applied Optics Branch in the Naval Research Laboratory's Optical Scientist Division, was presented the Navy's Meritorious Civilian Service Award. He was honored for his major contributions in the operational use of electro-optical and infrared countermeasure systems and in the improvement of aircraft survivability. Since joining NRL as a research physicist in 1969, Raymond has authored numerous papers and been granted six patents. . . . Allegheny Ludlum recently elected **Arthur Aronson** to the position of executive vice-president and chief operating officer. Art had joined Allegheny as executive vice-president in 1988 and was previously president and chief operating officer of Lukens, Inc.



Mark Tenney

Received a brief note from **Mark Tenney** about his recent retirement from the U.S. Army Reserve after more than 30 years of service. Mark is a major general in charge of the 416th Engineer Command in Chicago. He received the Distinguished Service Medal and the De Fleury Medal

for his significant contributions to military engineering. He will be returning full time to the civilian engineering firm he co-founded in 1969, now operating under the name of Tenney-Pavoni Associates, Inc. Specializing in general civil and sanitary engineering, the firm has five offices in the Midwest region. . . . Stay tuned for next month's edition.—**Mike Brose**, secretary, 841 Magdeline Dr., Madison, WI 53704

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Please send news for this column to: **Allan S. Bufford**, secretary, Office of the Treasurer, MIT, 238 Main St., Suite 200, Cambridge, MA 02142

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News from the 30th reunion: As luck would have it, a business trip to Europe caused your reporter to miss the on-campus portion of the festivities. Marie and I joined class revelers at the Ocean Edge Conference Center in Brewster on the Cape. Our introduction to the festivities was a delicious New England clam bake, arranged by **Jorge Rodriguez** and his committee. About 30 classmates, together with wives and children, were at Ocean Edge. About 40 percent of those there were from the "bucket-and-stopwatch-chemistry" community (Course X). That certainly was not the same fraction as class gatherings 30 years ago (where were the Course VI legions?). . . . At the business meeting following dinner, Jorge was elected class president; our immediate past president, **Tim Hart**, was elected to the newly created post of vice-president (work load for the president has become too much for one person to handle); **Tom Farquahar**, on the basis of his outstanding record of keeping the class books, was re-elected treasurer; yours truly, without an opportunity to decline the nominations, was given the twin opportunities to continue serving as your class secretary and agent. . . . Needless to say, the hard work of Jorge and the rest of the reunion committee paid huge dividends. The one thing he didn't get quite right was the Cape Cod weather, which in traditional New England fashion was of the "if-you-don't-like-it-wait-a-minute" style (we arrived in fog and downpour on Saturday, but Sunday was beautiful). In true '60 tradition of not being verbose with the class secretary, many of the attendees did not take the opportunity to bring us up to date on the past thirty years. What I have is a combination of my own inquiries and a few notes passed my way on the backs of cocktail napkins and other scraps of paper.

The day after the reunion Madeleine and **Jaime De Sola** were departing New York for the Netherlands. After a few years with Hess Oil, Jaime is looking for new worlds to conquer, and he and Madeleine decided to do it in Europe, where their children live. . . . **Tim Hart**, still in the software business and making big strides in serving telecommunications needs, was able to dispose of the last of the 25th reunion cups and "Hamus et Eggus" T-shirts. Tim led an interesting discussion on how we might use the class endowment (which your class agent notes is about \$600,000). Time proposed several alternatives that you will hear about in future class correspondence. . . . **Geraldine** and **Gerald Kaiz** made the reunion trip, as promised, in their 1960 Plymouth Fury. A number of the attendees took advantage of Jerry's offer of a nostalgia trip in the Fury. Unfortunately, the weather was not as cooperative as it could have been so the top-down touring was somewhat curtailed. . . . The prize for the greatest distance traveled to the reunion went to **Michael Kasser**, who joined us from Kona, Hawaii. Mike still looks as young as he did in 1960—it must be the triathlons, new baby, and Hawaiian sunshine. . . . At the reunion from sunny Phoenix, Ariz., were Karen and **Robert Hodges**. Bob manages the circuit materials division of the Rogers Corp.

Richard Levine is now in Richardson, Texas, where he is manager of digital cellular system design for Bell Northern Research, of Northern Telecom Co. He includes his work on digital cellular systems as "the latest feat in a checkered career which includes the laser printer which prints copies of your check or bill on your bank statement and other dubious achievements." Dick and wife Sara have three children. . . . Taking a cross-country trip from Studio City, Calif., to the reunion were Revital and **Barton Krawetz**. Bart had a distinguished 26-year career in the Air Force, where his last assignment before retiring as a colonel was as commander of the Air Force's Wright Aeronautical Labs. He joined Lockheed in 1986 and is now executive vice-president and general manager of Lockheed Research, Technology and Engineering. Prior to his current position, Bart was assistant general manager of Lockheed's "Skunk Works." While in the Air Force, Bart earned a master's in Space Physics from Air Force Institute of Technology and a PhD from the University of California, Davis. He and Revital have two children.

Wishing he could have been at the reunion was **Marc Weiss**, who writes from New Orleans that he is chief scientist of the Naval Biodynamics Lab. Marc enjoys the Crescent City's good food, Mardi Gras and Jazz Festival. Marc's son is with the Cincinnati Ballet and daughter is a junior at Cornell. . . . A short note from **Richard Strauss** in Chicago says that he has retired from the textile industry and is now an SEC registered investment advisor. . . . **Robert Kerber** sends us a Long Island *Newsday* article on classmate and State University of New York at Stony Brook colleague **Anthony Phillips**. The article, entitled "Tying the Knot between Math, Art," relates how Tony combines his professional interest in topology with knots, specifically the description of third-grade students (among others) describing how they tie knots. Tony is filming the knot-tying, with the ultimate goal a video called "How to Tie a Knot."—**Frank A. Tapparo**, secretary and class agent, 15 S. Montague St., Arlington, VA 22204

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Please send news for this column to: **Andrew Braun**, secretary, 464 Heath St., Chestnut Hill, MA 02167

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J. Ladd Howell who is president of Classic Commercial Villas, Inc., developers of Fort Lauderdale, Fla., office villas. Ladd has built 35 individual office buildings to be sold to small businesses that no longer wish to rent office space. This project opened in June, with Ladd and his wife Carol cooperating on all the arrangements. The Howells have two daughters: Laura (20) will graduate from the University of Texas in December, and Michelle (16) will attend Austin Community College in September, with an eventual transfer to the University of Texas. Michelle is skipping her senior year in high school to get an early start in college. Ladd is president of Howell Companies, Inc., Realtors, former president of the Coral Gables (Fla.) Board of Realtors, and former vice-president of the Coral Gables Chamber of Commerce. . . . **Mitch Maidique**, president of Florida International University in Miami, has been appointed by President Bush to serve on the President's Education Policy Advisory Committee. Paul Grey, '54, president of MIT, visited FIU last February and was the main speaker at the inaugural ceremonies of FIU's new engineering and computer science building.

Talbot S. Huff, Jr., vice president and general manager of E-Systems Melpar Division, has been awarded an honorary Doctor of Science degree by George Washington University, Washington, D.C. Talbot received his honorary degree during the

May commencement ceremonies of the Georgetown University School of Engineering and Applied Science, where he delivered the commencement address. As vice-president and general manager of E-Systems, Talbot directs operations and business development in the areas of remotely controlled intelligence systems, information systems, electronic combat systems, communications products, physical security sensors, technical services, and logistics support. He has been a member of the Virginia Governor's Task Force on Science and Technology, chairman of the IEEE Industrial Planning Subcommittee, and a member of IEEE's High Technology Panel. . . . It is with sadness that we report the death of **David D. Friesen** on April 7. We do not have further details, but only know that his death was reported to the Alumni Association by his friend, James Taylor, '63.

An item on Maryland automobile license plates from **Ted Goldsmith**: In Maryland, the standard license plate has three letters and three numbers (ABC 123). A "vanity" plate may also be obtained with specified letters and/or numbers. Ted has discovered that an "organization" plate is also available, when a group requests that a series of plates be reserved for its members. He has seen plates for Penn State alumni (PSU1234) and Johns Hopkins University (JHU0123). The Maryland Motor Vehicle Administration informed Ted that MIT could do the same for its Maryland alumni, and he would like to pursue the issue. I don't know who the proper individual might be, but I suspect that the MIT Club of Baltimore or Maryland or Suburban Washington might be the proper organization to do the requesting from the Maryland MVA. Anyone interested can contact Ted at 8508 White Post Ct., Potomac, MD 20854, (301) 469-0698. There are about two dozen '62 alumni living in Maryland, so several hundred alumni may have an interest in Maryland-MIT license plates.

We are always looking for news concerning our classmates. Please drop me a line whenever you have the opportunity.—**Hank McCarl**, secretary, P.O. Box 352, Birmingham, AL 35201-0352.

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I am happy to report a good load of mail this time. There is big news about **Tom Gerrity**, but first some other choice morsels. . . . **Henry Nau** has got a new book out, *The Myth of America's Decline* published by Oxford University Press. Help him make it a big seller. If you cannot get it locally, contact Oxford Press Dept., CCO, 200 Madison Ave., New York, NY 10016. . . . **Bob Jahnke** has been in the computer world since graduation. He's been working on his own the last 15 years and reports that things are going well.

Allen Tobin is still teaching biology and neurobiology at UCLA. He has recently become chair of the interdepartmental program in neuroscience. He is also scientific director of the Heredity Disease Foundation, which coordinates research on Huntington's Disease. . . . **Paul Krehbiel** is now "on loan" from the Physics Department at New Mexico Institute of Mining and Technology ("NM Tech") setting up a new electrical engineering department. Paul has been at NM Tech since leaving MIT in 1966. He was a full-time researcher until 1984, then joined the physics faculty to get in to teaching. Both his children are "leaving the nest" by attending college. Also, his wife Kay is getting ready to go to the University of Arizona to complete her Master of Library Science. That sure is a barren nest. Paul mentions not getting a copy a couple of years ago of the 25th reunion book. Paul, you and anyone else interested should call Ken Anderson at (617) 235-9530. As long as they last he can ship you one for ten bucks a pop.

Now to **Tom Gerrity**. You have all heard of the Wharton School at the University of Pennsylvania. Well, Tom was just named its 11th dean.

Tom was a Rhodes scholar in economics at Oxford, then returned to Tech for his doctorate. He was then on the faculty at MIT's Sloan School. He also founded Index Group, consultants in strategic management of information technology. That firm later merged with Computer Sciences Corp. About going to Wharton, Tom reports, "It means, regrettably, that Anna and I and the kids will be leaving the Cambridge area for Philadelphia, but it [also] means a very exciting opportunity for me to help shape the direction of one of the leading business schools in the world." Best of luck, Tom.

The rest of you, get yourselves appointed to something and help me fill this column. See you next time.—**Phil Marcus**, secretary, 3410 Orange Grove Ct., Ellicott City, MD 21043, (301) 750-0184

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As I'm writing, it is exactly one year ago that we "reunited" together in Cambridge at our 25th. The more arithmetically adept among you will have already figured out that there are only four more years till our 30th reunion.

An Alumni Fund note from **Richard Kline** commented on how much he had enjoyed the reunion. He saw many of his fraternity brothers including **Walter Anderson**, **Dave Evans**, **Norm Davis**, **Bob Colvin**, and **Bruce Stevens**. Though Richard didn't happen to say which fraternity it was, my old trusty copy of *Technique* led me to the answer ATO.

St. Martin's Press has recently published the fifth edition of *Technology and the Future*, edited by **Al Teich**. The sections of the book are Thinking about Technology; Forecasting, Assessing, and Controlling Technology; Reshaping Technology; and Using Technology. It's clear and obvious that Al must have paid attention to what was being said in 21.03.

I received a nice letter from **Ed Wolcott**, who is in Gainesville, Fla., where he is running a variety of family interests in California from a distance, following the death of his parents. Ed's wife, **Willa**, recently received a doctorate in education from the University of Florida and is now head of the university's reading and writing department. Their son, **Kedron**, graduated from MIT this June in the avionics option of Course XVI. He will be attending graduate school at Stanford. Ed empathizes with earlier comments in this column about MIT's tuition and notes that Stanford is no cheaper. Their daughter, **Charley**, is attending Furman University in Greenville, S.C., which is described by Ed as "not an easy school." Thanks for the letter!

Recently, while in the Boston area doing Dartmouth business, I had the opportunity to spend a delightful hour with **Pat Gage** at his new office at Genetics Institute, Inc., where he is executive vice-president. He gave me a rundown as to what is happening in biotechnology and told me about his family's move from New Jersey to Lexington. He and his wife have two small youngsters. They all seem to have accommodated well to the move.

Speaking of Gainesville, I received a phone call from **George Piotrowski** announcing that he has retired from the engineering faculty at University of Florida after 20+ years of service. He is devoting full-time to his consulting business DASC, Inc. The Piotrowskis have had a busy year: they bought a beachfront vacation home near St. Augustine; son Mark graduated from high school and started at the University of Florida this fall; Linda completed another year as an elementary school teacher; and son Eric is doing fine. George will be attending his 30th high school reunion in a small upstate New York town and promises to send along a report of what it was like. He closed the conversation with a good news, bad news observation about life at MIT. The good news is that you quickly learn that you can do things well in a short period of time—if you're good and if you're forced to. The bad news is

that the habit of the "all-nighter" (or its later-in-life equivalent) isn't much fun after a while.

Well, that's enough pseudo-philosophy for today. Please send some news; the cupboard is bare. Thanks.—**Joe Kasper**, secretary, RR 2, Box 4, Norwich, VT 05055

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Peter Heinemann and his reunion committee deserve out thanks for a delightful 25th reunion. From the Boston Pops to Sunday brunch, a great time was had by all 236 attendees.

Bill Brody reported we had exceeded our target for the class gift, with over \$2,250,000 pledged and 70 percent participation in the class. The Frederick Fassett Fund had contributions over \$250,000 and will represent a fitting memorial to Dean Fassett. Kudos to the entire gift committee, and particularly to **Karl Chang**, for their help in reaching these goals.

The Pops concert began with President Gray, '54, and his wife **Priscilla** joining **Jim Taylor** and **Gladys** and the rest of the class of 1965 for box dinners. We were treated to a "personal" story from the conductor, **John Mauceri**, who told the assembled crowd that his wife had dated a member of our class "who always walked around carrying a sledgehammer." We hoped that wasn't the reason **Charlie Frasier** didn't attend the reunion!

Friday we all lined up for our class picture. For those who weren't there, the picture was taken by a camera that rotates to get a long continuous exposure and results in an extended photograph. **Al Tarvalon** kept trying to get on both ends but just couldn't move fast enough.

The harbor cruise was a memorable (if noisy) night of dining and dancing while cruising Boston harbor in an enormous enclosed ship—certainly didn't remind anyone of the old Boston harbor cruise ships.

Saturday, **Margaret MacVicar**, dean of undergraduate students, hosted a seminar on technology and the arts for our class. We ended the day with dinner and the slide rule contest at the Museum of Science. A dozen hearty souls brought their slide rules and competed for everything from "most used" to "fastest slide rule." **Ron Newbower** even brought a tie pin with matching cufflinks, all of which were working sliderules!

Congratulations to all those who assisted and attended the reunion. We elected our class officers—**Peter Heinemann** will continue as President, **Steve Deutsch** as vice-president, and **Dave Manalan** as treasurer. **Peter Sexton** and I have taken over from **Steve Lipner**, splitting the job of secretary—I will act as secretary for the *Review* and Peter as corresponding secretary. **Ed Hoffer** will be class agent.

On the news front, we note that **Ralph Cicerone** was recently elected to the National Academy of Sciences. His research has focused on the chemistry of the atmosphere, with a particular focus on stratospheric ozone and the role of other gases in the Earth's energy budget and climate systems. Our congratulations to Ralph.

I'll save most of the rest of the news on the class until the next issue. Write when you can.—**George McKinney**, secretary, 33 Old Orchard Rd., Chestnut Hill, MA 02167, (617) 890-5771

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Our 25th reunion is less than eight months away—make plans now.

Matt Fichtenbaum is still architecting and designing automatic test equipment at GenRad, playing Scandinavian and American dance music, and attempting to deny adulthood (aided by his daughter **Rachel**, 8).

Steven Weiss has a son, **Jonathon**, in the class of '93. His son **Jeremy** is a high-school freshman and a "computer hacker."

After 17 years with Hewlett Packard, **Sammy**

Shina is now an associate professor of engineering at the University of Lowell (Lowell, Mass.). He is working on developing a BS manufacturing engineering curriculum, and would like suggestions from fellow alumni. . . . During the year, **James Lash** and his partners acquired another company, bringing total employment to about 50,000. He also returned to MIT for the first time since graduation and noticed some changes. (You are coming up for the reunion, aren't you James?)

William Dietrich recently accepted a position as senior vice-president of Sears Mortgage Corp., in Riverwoods, Ill. . . . **Jack Wright** is president of Jack Wright Associates, a microcomputer network consulting firm in Princeton, N.J. . . . **David Wyss** is now research director at DRI/McGraw-Hill, in Lexington, Mass.

John Freeman reports that he has been joined in Washington by Dick Schmallesee ('65), who was a fraternity brother and roommate. . . . **Harry Moser** recently became president of a second division, Raycon Corp., which produces systems for aerospace and automotive industries. He says that the commute between Chicago and Ann Arbor is even longer than the Mass. Ave. bridge.

That's it for now. By next month I will have caught up with all the news you've sent. It's time to write again.—**Jeff Kenton**, secretary, 7 Hill Top Rd., Weston, MA 02193

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This Spring **Edie N. Goldenberg** was elected to honorary membership in Phi Beta Kappa at the University of Michigan. This is a short column this month; please send more news.—**Jim Swanson**, secretary, 878 Hoffman Terr., Los Altos, CA 94024

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Please send news for this column to: **Gail and Mike Marcus**, secretaries 8026 Cypress Grove Ln., Cabin John, MD 20818

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The June doldrums have set in as these notes are dispatched to the *Review*. As many of you probably also will have done this summer, I will soon attend the 25th reunion of my Norwich Free Academy (Norwich, Conn.) high school graduating class. Hope to see classmate (both NFA and MIT) **Tom Lamb** there and find out his latest doings in the world of civil engineering. . . .

Michael A. Neschleba is in Polaroid's Reagent Manufacturing Division, and the job took him to Europe in the summer of 1989. He writes, "It was a first for me, and I thoroughly enjoyed Amsterdam's art, etc., and streaking down Germany's Autobahn." . . . **Rexford A. Stark** tells us that he is running his own mail order business, Rex Stark Americana, specializing in American historical antiques.

Eben T. Walker writes that his third child, a daughter (Brooks Elise) was born last January 28. . . . **Richard Gawlick** is director of Worldwide Operations, Semiconductor Products Division, of the Unitrode Corp. in Watertown, Mass. Previously he was general manager of Microwave Power Devices at M/A-Com, Inc. in Burlington, Mass. . . . We read in the *Sun-Journal* of Lewiston, Maine (March 22, 1990): "State Representative **Conrad Heesch** (D-Wilton), announced that he will seek a second term in the Maine House of Representatives for District 54, which includes Carthage, Temple, Dixfield, and Wilton." In his first term, Conrad worked to create and pass the Affordable Housing act of 1989, and he was involved with the citizens' organization, "No Thank Q Hydro Quebec," part of his effort to help minimize the environmental effects of energy production and consumption. A longtime resident of Wilton, he works as an architectural

designer, consulting on energy-efficient and solar structures.

Mark Lively is a senior manager at Ernst & Young in Washington, D.C., where he consults on gas and electricity utility pricing. *Public Utility Fortnightly* published his article, "Tie-Riding Freeloaders—The True Impediment to Transmission Access," last December. Mark is active in the MIT Club of Washington and is finishing his second year as treasurer. As MIT Club Treasurer, Mark succeeds classmate **Smith Wood**. Smith has sold his microcomputer consulting company, Barrister Information Systems, and has been "retired" since last summer. **Bruce Parker** was co-host with Mark of the MIT crew reception after the varsity women and the varsity heavyweights participated in the First Annual Potomac Regatta. Bruce was a vice-president at Barrister and is now vice-president of the Potomac Consulting Group, which designs microcomputer-based local area networks. Mark and Bruce have considered a joint project in Eastern Europe for their firms.

To end this refrain, I recently saw classmate **James Woods** in "Immediate Family," quite a different movie role for him.—**Eugene F. Mallove**, secretary, 171 Woodhill-Hooksett Rd., Bow, NH 03304

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Jerome S. Gordon particularly enjoys living in the Pacific Northwest. He is in the private practice of psychology, working primarily with children, adolescents, and their families. . . . **Stephen D. Umans** and his spouse, Denise, are the proud parents of a daughter (first child), Dayla Edel Umans, born October 27, 1989. . . . **Howard S. Manasse** is the ophthalmologist-retina specialist director at Saint Vincent Ambulatory Surgery Center's Department of Ophthalmology. He has three children: Jordan, 9; Carlen, 6; and Matt, 2.

Polaroid Corp. recently announced that **Carl J. Yankowski** has been named president of the Business Imaging Division in Cambridge, Mass., after having been vice-president of marketing for Polaroid. . . . the undersigned is corporate counsel for American Specialty Insurance Group, which specializes in sports (including major league baseball and other organized sports), entertainment and leisure insurance throughout the United States. The corporation is located in a 100-year old renovated brick hardware building in Roanoke, Ind.—**Robert Vegeler**, secretary, Beers, Mallery, Backs, Salin & Larmore, 1100 Ft. Wayne Natl. Bank Bldg., Ft. Wayne, IN 46802

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Our 20th reunion will be held in June of 1991. Please make plans to attend.

Congratulations to **Ken Weisel** and his wife, Pat Jenkins (Mills '80) on the birth of Lauren Meredith, born May 11, 1990. They live very happily in Roseville, Calif., near Sacramento, where Ken is the director of Roseville Electric Utility and Pat is account executive with the Roseville Chamber of Commerce. . . . **Mark F. Roddin** writes: "After the big October 17 earthquake, I became very busy doing the planning and coordination for an emergency ferry passenger service across San Francisco Bay paralleling the San Francisco-Oakland Bay Bridge. They kept the service going after the broken bridge section was replaced because Cypress Streets and other highway structures were still down. Now I have a breather since we got a semi-permanent service started on March 26, 1990."

Thomas R. Smith teaches application programming at ICAD, Inc., Cambridge, Mass. and has three children (Heather, 10; Andrew, 7; and Malley, 3). . . . **George F. Providakes** is department head of D96, UHF/SHF Satellite Communications of MITRE. George received an SB in electrical engineering from MIT and an MS and PhD in elec-

trical engineering from Cornell.

Adrian Bejan (PhD, 1975), J.A. Jones Professor of Mechanical Engineering at Duke University has been selected by the ASME as the 1999 James Harry Potter Gold Medalist, "for his original and unorthodox ideas, journal articles, textbooks, graphics, and lectures demonstrating that engineering thermodynamics is an active and often controversial field of research, and for encouraging others to invest their creativity in the future of the field."—**R. Hal Moorman**, secretary, P.O. Box 1808, Brenham, TX 77833

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A few people sent in news. Please join them and send us your news. **Gary Chirlin** recently completed an EPRI study on slug testing and developed new type curves for this widely used test of hydraulic conductivity. He also continues to consult on groundwater issues for Chirlin & Associates, Inc. For the past year, **Michael Rowny** has been chair and CEO of the Ransohoff Co. in Cincinnati. The company makes aqueous cleaning machinery, which is cost effective and environmentally sound. (It's a long commute from his home in Washington, D.C., so he enjoys getting home to see Melissa and his two daughters, Elizabeth, 8, and Julia, 4.)

Bob Goodof writes that he is still a vice-president who is picking stocks at Eaton Vance Management. The work is fun and "the travel's pretty good, and often educational," so who could ask for more? In between he is goal tending "on call" around the Boston area, and skiing, cycling and hiking to round out the seasons. He also has been riding in the Pan Mass Challenge, a 194-mile bike ride from Sturbridge to Provincetown that solicits sponsors for the Jimmy Fund. . . . On January 1, 1990, **Richard Scordato** took over as president of MLA, (Medical Laboratory Automation), a manufacturer of instrumentation for hospital labs. He is enjoying the job even though he finds the travel difficult.

That's it for this month's news. Not much, so please send us more news and have a great fall and Happy Halloween.—co-secretaries: **Wendy Elaine Erb**, 6001 Pelican Bay Blvd., Apt. 1003, Naples, FL 33963; **Albion Fletcher, Jr.**, 135 West St., Braintree, MA 02184

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John Lane has been promoted to vice-president of technology at the Hartford headquarters of Aerospace Metals, Inc., a group of companies involved in recycling. He has been with the company since 1985. . . . **Doug Mink** was married in May of last year, for the second time ("I sure accumulated a lot of friends since the first wedding!"). He is still at the Smithsonian Astrophysical Observatory in Cambridge and doing his daily 20 miles on the bicycle.

Dan Greenbaum, commissioner of Massachusetts' Dept. of Environmental Protection, was the subject of an article in the *Gloucester Daily Times* on environmental issues in the state. . . . **Sherry (Horn) Kedes** is practicing ophthalmology in Massapequa, N.Y., with husband Dennis. Their two children, Michael ('01) and Cindy ('04), love science and math, and perhaps may see MIT in their futures.

Yours truly has changed positions, after about five years with the same group. You think your company has been bought and sold a few times? Without so much as changing desks, I had been manager of MIS with Allen Corp. of America, then Allen Division of the Singer Co., then Allen Holding Co. (Bilzerian Limited Partnership II), then Allen Corp. (a CAE Industries, Ltd., company), then Allen Division of CAE-Link, then Link Training Services Division. With that behind me, I have taken a position as director of the Video Teleconferencing Program with Advanced Technology, Inc., in Reston, Va. (which is a Black and

Decker company, the result of which merger is for sale—it never ends). I direct system integration efforts for two-way interactive video teleconferencing projects and enjoy it. This morning Ruth left for Florida to compete in the WIBC Nationals (bowling), and in two weeks I leave for San Francisco for the SPEBSQSA Convention (as will **Martin Romeo**).

Yesterday was the last day of school for Eric ('96), a junior in the fall, whose grades aren't here yet, and JR ('03), who was straight-A and starts the fourth grade in September. Eric has been pumping iron to get ready for football season, and at 5'11" and 195 lbs., can easily bench press his father. His little brother prefers hooking bluegill (and the occasional "big old bass"). Don't leave me telling fish stories—write!—**Robert M.O. Sutton, Sr.**, secretary, "Chapel Hill," 1302 Churchill Ct., Marshall, VA 22115

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Looks like this will be the shortest column on record, for which your humble scribe is frankly grateful. It's 85 degrees and humid tonight, no weather to be sitting in front of a hot Macintosh pounding out a column. So thanks for the consideration.

Doctors, doctors, everywhere! First up, the word from **Peter Grain** is that he has been practicing neurosurgery in Kankakee, Ill., since 1988. He and his wife, Annette Barnes, have just celebrated their second anniversary. . . . "I'm finishing my second year of medical school," writes **Elizabeth Scarito** (nee **Bagnall**). Elizabeth took part in one of the National Boards in June. "Our son Michael is a very active 2-year-old who is keeping both Phil and me very busy. Between baby, school, and Phil's work we haven't had much time to sail or travel!"

Finally, a note from **Mark Cohen**. Mark's living in Acton, Mass., with his wife Jennifer and two "fantastic" children—Natalie and Andrew. He is a practicing pediatrician and medical director of the Acton Medical Association. "Coaching little league is my fun springtime activity."

By the time you read this it will be cold again, so send me some news to warm up the long, dark winter nights.—**Lionel Goulet**, secretary, 115 Albemarle Rd., Waltham, MA 02154-8133, (617) 899-9694

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At our 15th reunion, the biggest news was the very generous reunion gift bestowed upon the Institute by members of the class of 1975. Thanks to the rigorous effort by our gift chairman (class agent, **Peter Mancuso**) and the enthusiastic 18-member gift committee and, of course, those of us who gave, our class raised \$87,221—the second largest 15th reunion gift ever. If donations continue, then by the time I prepare our next column, we might break the record. So far, 361 members of the class (40%) contributed to the reunion gift campaign. Our median gift was raised from \$50 in 1989 to \$100 this year. Our class not only led the 1970s classes in Koch Challenge Fund totals—\$15,185 from 156 classmates (43% of the total donors); of all classes, we have the eighth highest total Koch Funds earned and the second most Koch Fund donors. These gratifying numbers were announced to all who attended the Technology Day luncheon, and I believe I speak for all our classmates in attendance when I say it was with great pride that, when asked to rise as a group, we received a thunderous round of applause. (I think most of us were pretty surprised as well!) Former MIT President Howard Johnson even came over to our tables and pressed some flesh, thanking us youngsters for our generosity.

We do not mean to rest on our laurels, now that the torch has been passed to new class agent **Bill Wang** (formerly known as Sherman) who

plans to continue the record-breaking traditions set in the Mancuso era.

At our class meeting on Sunday of the reunion weekend, those of us in attendance started to put our heads together as to what should be the focal point of our 25th. Also at the meeting, class officers were elected: **Dave Wargo**, re-elected as president, **Beverly Herbert**, elected as vice-president, **Charles Fendrock**, re-elected as treasurer, and your truly, re-elected as secretary. It was a great reunion weekend—from belting out an alma mater ballad at Tech Night at the Pops (while popping down a few belts), to becoming environmentally educated at the Technology Day lectures (which, in true undergraduate spirit, I cut), to glorying in a two-hour slide show of the greatest MIT hacks (presented in a basement pub in Ashdown House that made the Muddy Charles look like Maxim's), to dancing and gambling up a storm at the casino party at the Children's Museum, to our forward-planning class meeting, and to all the unplanned, spontaneous and after-hours events. Merci beaucoup to our one-man reunion committee, **Dave Wargo**, and the Alumni Association for planning and providing such an enjoyable time. (Notice I don't mention the food—something to work on for our 20th.)

Other news: In June, **Matthew Scott** became professor of developmental biology at Stanford Medical School. Matt's wife, Margaret (Minx) Fuller (PhD '80) will be a professor in the same department. Matt was awarded the Passano Foundation Young Investigator Award this year. . . . **Anita Horton** spent 1989 in Thailand, living in a village and working in a refugee camp. She returned to the United States to work on a project for MIT-ILP, and then back to Thailand, where she plans to work with a group of Thai women to establish a foundation to support operation of Christian Children's Homes for orphans and abandoned children—"God willing." Anita's daughter Sara is now 6 years old. . . . **Dave Wargo** joined the Putnam Companies, Boston, in December 1989 as managing director, senior analyst. . . . **Bill Siver** is vice-president, R&D and vice-president, engineering of Cognex Corp. . . . **Guy Plunkett** writes, "I am back at the University of Wisconsin, after a postdoc at U.C. Berkeley and a stint as a 'Red Cross volunteer/molecular biology consultant' in San Antonio, Texas, while job hunting. I am involved in a project to sequence the *E. coli* genome—a pilot project for the Human Genome Project. My wife Joanne and son Ben (7) enjoy Madison."

James W. Simon married Cynthia A. Baker on April 21 at the Grace United Methodist Church in Corning, N.Y. He holds post-MIT degrees from the University of Chicago Business School (1980) and the University of Connecticut Law School (1987). His wife is a 1979 graduate of Westminster College with an MBA from the Wharton School of the University of Pennsylvania (1984). . . . Ac-



Bruce John Davies

cording to a press release, **Bruce John Davies**, principal landscape artist for CUH2A, a Princeton, N.J., design and planning firm, was elected president of the New Jersey Chapter of the American Society of Landscape Architects for a two-year term. He has also been appointed to the advisory board of the Rutgers University Department of Landscape Architecture at Cook College

in New Brunswick, N.J. His specialty is site planning for major corporate facilities and urban parks and recreation projects. His recent assignments include management of site design and master planning for major pharmaceutical companies. . . . Last year, **John B. Wilbur** was promoted to corporate relations manager in the Public Affairs Division of East Ohio Gas Co. He is responsible for managing the East Ohio Gas Co. Fund and coordinating the company's activities with its philanthropic groups and non-profit agencies. He and his wife Margaret, a physician, reside in Fairview Park with children Sean (6) and Daniel (3). . . . In April, **Robert P. Schreiber** was appointed associate of Camp Dresser & McKee, Inc., of Cambridge, where he is a team leader with expertise in the analysis and modeling of groundwater flow and contaminant movement, and has served as director of groundwater modeling on several major projects. He has developed original computer programs to model three-dimensional groundwater flow, to simulate water quality, and to store and display hydrogeologic and groundwater data.

Steven A. Simoni writes, "I never did write to let you know of my marriage to Linda Hamblen on August 8, 1976. Diane was born on September 27, 1981 (3²/3³/3⁴). Diane has been getting straight A's in school. Stephanie Elizabeth—the dancer in the family—was born May 4, 1984. I've been getting into big game fishing the past few years (since Suffolk Law). In the last year alone I've fished in Bimini (bonefishing), Key West (wahoo), Montauk (blue shark), Hyannis (35 bluefish in one day), Katmai National Park, Alaska, (lots of Coho salmon), Kona (skunked), and Ft. Lauderdale (sailfish). We hope to spend a fair amount of time this summer at our island home either in our pool or on our beach. We'll miss Dan ('76) and **Joanne Kersten** this summer as they have stayed with us most of the last three summers. We do see **Danielle** and **Ron Bick** fairly often, and our children play together quite often. If anyone else is interested in getting together in search of a 1000-pound-plus black marlin—let me know."

Richard Shafer writes "Though I will be at the reunion, I have been shamed by my wife into writing a few notes to you. She did this by writing the details of our wedding last June to her class secretary, MIT '80. So one or two points of what I've been doing since my PhD in '83 at the University of Maryland (physics) through the facilities at the NASA Goddard Space Flight Center.

I spent two very stimulating years at the Institute of Astronomy in Cambridge, England, working on topics in x-ray astronomy. I then moved to a temporary staff position in the EXOSAT Observatory team of the European Space Agency. EXOSAT was ESA's first x-ray astronomy satellite. After two years in Darmstadt, Germany (and briefly Noordwijk, Holland, I returned to the States in April of 1987 to a permanent job with NASA, again at Goddard (coming almost full circle). Now, though, I am doing infra-red astronomy (what's a factor of 10⁶ in frequency among friends), as the deputy principle investigator for the Far Infrared Absolute Spectrometer experiment on the recently launched Cosmic Background Explorer. Lots of work is still to be done in calibrating and understanding the instrument, but we already have made a significant contribution to observational cosmology with the first 11 minutes of reduced data.

Of even more importance is my meeting Gwen Freeman, '80 on my return from Europe. We met at parties for Alanna Connors '78 and Phil Veatch '79, during the summer of '87, and two years later we got married with many alumni in attendance. Details of the event were sent by Gwen to her class notes.

Married life suits me fine. The next milestone is the acquisition of a house. We are waiting for a house in a new development now under construction. The house has walls, floors and a roof, and should be ready for us to entertain out of town guests around the 4th of July. It's con-

venient for Gwen and me that '75 and '80 have so many reunion activities in common."

I had a post-reunion reunion in New York at the Hudson River Club with **Leonard Deroma**, whom I hadn't seen in eight years. Lenny works for a subsidiary of Barclay's and lives on the East Side with his wife, Mary, son Michael and, perhaps by the time you read this, a new addition. We had a wonderful evening and agreed that a yacht moored in front of the restaurant would have been a nice toy to have on the Charles back in the good old days.

After my re-election as secretary, I was asked by a classmate to make my columns "juicier." Since when do you people send me any juicy news? I have to beg to hear about job promotions and births. But send juicy news, if possible.—**Jennifer Gordon**, secretary, c/o Pennie & Edmonds, 1155 Avenue of the Americas, New York, NY 10036 or 18 Montgomery Pl., Brooklyn, NY 11215

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The mails have provided us with some news, but we certainly could use more.

From **Mick Ryan**, a laconic note: "Mining engineer at Empire Coal Co. in Gnadenthen, Ohio." . . . **Neil Kaden** writes: "Happily married over a year now, to Criselda Palomo, a native Texan. Will be flying to Boston (secretary's note: now past tense) to visit my sister, Debbie Krensky, '78, and her family, and show Cris Boston, MIT, and what cold Yankee winters are all about." . . . **David Snyder**, MD has a "hospital and outpatient practice of general and child psychiatry." . . . And **Burt Rubenstein** has " . . . joined Bull Worldwide Information Systems as director of technical enhancement to explore various areas of software technology."

Ronald M. Salomon reports the birth of a second daughter, May 11, 1989, Emily. Becky, age 3, is thrilled to have her. . . . **Anthony Lake** was elected to the partnership in Peat Marwick, as regional director of computer and communications consulting. He has 4-year-old triplets (two boys and a girl, non-identical) and recently ran into **Keith Amundsen**, who was visiting St. Louis from his home in the Boston area.

Olympio De Marco writes: "Attention NRSA members circa '72-'78! Where are you Mad Dog, Bitch, Roland, Jerry, Fred, Claudio, Wink, Nick, Bent, Six Foot, Pud, Walt, Dr. J, Nobragail, Monster Women, etc." How about a reunion at Good Harbor Beach this summer? Call Limp at Alliant Computer, Littleton, MA. P.S. Boob, you bring the lobsters, Holy Cow!"

From the Rev. **A. Carl Sharon**: "Have gone from one-half time to full-time Lutheran campus pastor at Yale, starting August 1989. A new thing I've started is the Yale Faith and Science Colloquium, a weekly lunchtime gathering for faculty, staff, and students to talk about issues in faith and science. None of the other chaplains here know what to think of scientists! I also organized a three-day symposium on faith and science, bringing in Prof. Langdon Gilkey from U. of Chicago. Part of what he talked about was his experience at the Scopes II trial in Little Rock, Ark., in 1981—they were trying to get 'creation science' taught as an alternative to evolution in public schools. Creation science justifies the Genesis creation accounts. It's amazing how widespread fundamentalism/Biblical literalism is among intelligent people—and even scientists."

And as for your secretary, by the time this is in print (I am writing this issue of the notes in late June), I will hopefully have ended a 15-year career in commodity futures industry and have made the transition successfully to an extremely high-tech set of areas revolving around speech recognition. It is both frightening and exhilarating. On the fear front, our quasi-speaker independent, quasi-continuous speech recognizer is now six months behind schedule and many thousands of dollars over budget. It promises to make

obsolete everything commercially available and certain projects in certain labs. However, we are having difficulty configuring a custom chip set to work correctly. The difficulty involved in going from a wire board to a printed circuit board for a device this sophisticated is huge, at least relative to our size. In case you were wondering, the "venture" capitalization is our own (my brother and myself). We are so far beholden only to ourselves, which is great in terms of control, but frightening with respect to financial risk. I have been giving serious thought to either a private placement or spinning off a portion of the technology and taking it public. I have gotten some nibbles from underwriters for an initial public offering (IPO). If I do take that route, you will all know in a more timely fashion, as it will doubtlessly be covered via a "tombstone" in the *Wall Street Journal* and/or the *New York Times*.

On the exhilarating side, we are already selling one product, the voicebox, which is meeting a certain amount of commercial acceptance. In the July issue of *Byte*, there was a special feature on a general review of alternative input devices (other than the qwerty keyboard), of which speech recognition was one component. And there we are, with competition the like of Texas Instruments, etc. I am pleased to report that the review was good and that, on a cost basis, we are probably the lowest per word provider of PC-based recognition in the United States with the voicebox for its type of speech recognition. In addition, my brother has made a possibly revolutionary discovery in Digital Signal Processing (DSP) which has applications outside speech and hopefully, by the time you all read this, will have submitted a patent application. We have other speech recognition technology to take out of the lab, but as of my writing these notes, do not have the funds to do so. Hopefully, before 1990 is out, this will change.

The only problem with being a high tech entrepreneur is that I am not making any money yet. Instead, the business is burning money, a situation I hope will be changing soon as the result of the above mentioned *Byte* review and certain proposals we have pending to create and license some custom speech recognition products. About these proposals: there is a high probability, better than 50 percent, that I will be doing business with Japanese firms in spite of giving certain American firms a first chance. These American firms move with a slowness that is hard to believe in spite of reading extensively about this. These companies seem to have a problem—very few people have any authority at all to make any type of decision, and even then, only with a tremendous amount of consultations and meetings especially relative to the project proposal and its cost. Some of the companies we have tried to begin dialogues with are household names. How they hope to continue to be household names, and not be pushed aside in the next decade, I can not fathom based on my experience so far.

But perhaps one legacy of the futures business is my ability to quickly make up my mind on never fully complete information. I am accustomed to having to make do on less information, with less time for analysis than most other lines of work. So my foreshortened time frame may be coloring the above observation. We will see if this is the case, or if American firms have gotten hopelessly bogged down in bureaucracy. Hopefully, I will be able to report that an American firm was responsive to one of our proposals inside a viable, for us, time frame by the next notes.—**Arthur J. Carp**, secretary, Voice Recognition Technologies, Inc., 220 Henley Rd., Woodmere, NY 11598, (516) 295-3632

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Let's dig right into the news. First from the New Titles Department. . . . **Stephen Gourley** is excited about his promotion to major, but even more

thrilled with the birth of his third child, Suzanne Elysabeth, in March. Katie, 4, and Jonathan, 2, think that their new sister is neat. . . . **Jill Kern**, quality applications planning manager with Digital in Marlboro, Mass., has been elected director-at-large of the American Society for Quality Control. She is responsible for developing and marketing integrated quality information system solutions to manufacturing industries for Digital's C/M Marketing Group. . . . **Steven Kaplan** is now senior vice-president, finance and corporate strategy, of AM International in Chicago. . . . **Deborah Darago**, still in Tewksbury, Mass., is now a manager with Tupperware Products. With her new position comes the use of a brand-new Dodge Caravan!

Howard Boles lets us know that he, his wife, Lisa, and daughter, Bethany, 4, are all doing fine. Howard is now working as a software engineer at Kronos, Inc. in Waltham, Mass. Kronos makes computerized time accounting and labor tracking systems. His boss is Jack Rich, '74, another MIT music major, part of "a small but proud group." . . . **Paul Fallon** and his wife, Lisa Dobberteen, were expecting their second child in August. Last fall, Paul started his own architectural practice and finds that he has more time to spend with his daughter, Amanda. He keeps busy at work with a nice range of residential, commercial, and institutional work. . . . **Kathleen Mensler** reports that she and husband, **John Cavolowsky**, are living in Haywood, Calif., with their son, Mark Cavolowsky, who is almost 4.

Now, classmates who live in the Boston area, I need your help. My new van needs an MIT sticker, you know, the kind you place on the bottom of the rear windshield? Could one of you kind-hearted souls do your class secretary a favor and pick up one for me the next time you are at the Tech Coop? Please mail it to me along with your lengthy letter, photos, etc., and you can be assured of receiving massive thanks in print (unless, of course, you prefer to remain an anonymous donor). Thanks a lot! Send all correspondence to me—**Ninamarie Maragioglio**, secretary, 8459 Yellow Leaf Ct., Springfield, VA 22153; e-mail to hertz@ccf3.nrl.navy.mil (internet)

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Alison Kohler writes, "I married David Owen in Baltimore in October 1989. I'm practicing civil trial work in Baltimore at a small private trial practice firm." Alison and David live in Fallston, Md. . . . **Mike Harlan** is stateside once again. "Sarah and I returned in August 1989 to southern California after spending nearly a year in England. I worked in McKinsey's London office. We thoroughly enjoyed exploring London, the U.K., and Europe. Now we're busy with our new daughter, Jennifer Brittany, born December 27, 1989." Mike and family live in Sierra Madre, Calif. . . . **Jerry Cole** reports briefly on a new daughter, Becky, born in November 1989. She is the Coles' third daughter.

Jim Roth was appointed assistant professor of medicine at Albert Einstein College of Medicine. He is a clinical cardiac electrophysiologist at Montefiore Medical Center in the Bronx, N.Y. Jim reports the birth of Samuel Adam in August 1989. . . . **E. Scott Golden** writes, "My law cases have come full-circle. During the last year I've spent an extraordinary amount of time on proprietary software infringement cases, hardware sales cases, and now on maintenance competition cases. Meanwhile, Jane's singing and songwriting career (mostly gospel and patriotic) is expanding. Danny (7) and Kimberly (4) are great." Scott and family live in Ft. Lauderdale, Fla.

We gather from a news clipping that **Lou Piazza** has left BBN Communications for Wellfleet Communications in Bedford, Mass., where he is senior vice-president. Lou and family live in Andover, Mass.

Class treasurer **Phil Kesten** is leaving Boston and Brandeis to teach at the University of Califor-

nia at Santa Clara this fall. Phil will do research in particle physics at Berkeley. Phil leaves a thriving intercollegiate rowing program at Brandeis that he started only a few years ago. . . . Your class secretary and **Diane Curtis** are sorry to report the death of Diane's dog, **Babe**, the Black Labrador who was one of the few East Campus legal four-legged residents of the dorm. Babe was a great companion and was no doubt one of the best-educated dogs around, going through BS and MS degrees with Diane at Sloan.—**Jim Bidigare**, secretary 2470 Billingsley Rd., Columbus, OH 43235; **Julie K. Stahlhut**, assistant secretary for Networks, Internet: jstahlhu@hstbme.mit.edu; Compuserve:76566,1012

79

Gail Kaiser was promoted to associate professor of computer science at Columbia University on January 1, and the next day she married Daniel Duchamp, a fellow faculty member in her department. . . . **Roger McSharry** is a board-certified internist doing a Navy-sponsored fellowship in pulmonary medicine and critical care at Stanford University Medical Center. Roger and his wife Karen, a physical therapist, live in Hayward, Calif., with their 16-month-old son, Mark. They were expecting a second child in August. . . . **Douglas Wegner** is an orthopedic intern at Yale New Haven Hospital.

Robert Hone, science producer for the science section of WGBH-TV in Boston, is working on a six-part series on the history and impact of computing, which will air in the fall of 1991. . . . **Carol Schwartz** writes, "Steve and I just sold our home in Cambridge and moved to sunny L.A. I'm an investment associate with Jones Lang Wootton, a real estate investment brokerage company, and I love it." . . . **Joo Hooi Ong Albritton** and her husband, an attorney, have also flown the Cambridge coop. In June 1988, they moved to Tampa, Fla., where they enjoy the winters but dread the summers. They have a two-year-old.

Kelly Hartshorn writes, "We're all packed up and ready to move to Santa Cruz, Bolivia, for a two-year assignment with Chevron. It'll be like homecoming for me, since I spent three years in La Paz in high school." . . . **Jasjeet Sood** accepted a position in March with General Electric Capital Corp., where he is responsible for investing capital in industrial projects. He says, "If you require capital for projects utilizing established technology,



Scott
Macfarlan

I'd be delighted to hear from you." . . . **Scott Macfarlan** has been promoted to senior vice-president of NCNB Services, Inc., a subsidiary of NCNB National Bank. Scott has been with NCNB in Charlotte, N.C., since 1983. According to a company news release, Scott is also a director of the Mecklenburg County Council of Boy Scouts, a member of the Charlotte Rotary Club, a former fund drive section chairman for the United Way of Central Carolinas, and a former president of the Harvard Business School Association of Charlotte. . . . Nothing else new here. In two weeks, I join the ranks of full-time job seekers.—**Sharon Lowenheim**, secretary, 98-30 67 Ave., Apt. 6E, Forest Hills, NY 11374

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Please send news for this column to: **Alan Weger**, secretary, 577 Westbrook Dr., Peekskill, NY 10566

81

I am writing this after returning from two class reunions—my five-year business school and Ned's ten-year college. We had a great time at both. I mention this because (for those who don't keep track of passing time and for non-math majors who cannot subtract 1981 from 1990) over nine years have passed since our graduation from MIT. If you take MIT and subtract problem sets, exams, cold Boston winters and 8 a.m. classes and then add ten years, what do you get? Reunion! That equals a weekend-long good time for all who attend! The reunion committee begins its work this fall. The committee is open to all classmates, and there is plenty to do. Please send your ideas for activities to me and I will forward them to the committee, and let me know if you would like to participate in the committee. We need Boston-area people for local work as well as a telephone squad to help us set an all-time attendance record. Please write or call soon.

Randy and Connie Bair Thompson are the proud parents of Andrew Bair Thompson, born on March 10, weighing 10 lbs. . . . **Jim Pekar's** first letter since graduation reports that Jim received his PhD in biophysics from the University of Pennsylvania in 1988 and is a National Research Council research associate at the In Vivo NMR Research Center of the National Institutes of Health in Bethesda, Md. He was invited to Japan early this year to deliver two lectures. He had previously studied in Japan at Tokyo University. On this visit, Jim enjoyed sampling the local cuisine and viewing fine examples of landscape architecture. . . . **Vicki Woolworth** received her PhD in chemistry from Stanford in 1988 and is a postdoctoral fellow at Children's Hospital in Oakland, Calif. Vicki married Michael Leadbetter in 1987.

Stephen Levin and Dale Von Ruden have separately started businesses using engineering principles for real-world applications. Steve is in the bike business, building composite bicycle frames. In addition, he works for a computer company, "trying to protect disk drives from people who push them off tables." Dale teamed up with John Castellano, '81, to form Up and Over Engineering, building all-terrain wheelchairs. . . . **Giles Novak** is a postdoctoral research associate at the Five College Radio Astronomy Observatory at the University of Massachusetts at Amherst. . . . **Randy Forgard** recently joined Cambridge start-up Beyond, Inc., as a principal engineer. The company is building electronic mail enabled groupware computer software. Randy married Julia Lancaster, SM '83, in October 1989. . . . **David Fische** says hello to all ex-NRSA folks. David designs satellite experiments at Lincoln Labs and is finishing a master's degree at Boston University.

Joann Stock is a visiting faculty member at Caltech in geological and planetary sciences. . . . **Saqui Jang** is a product manager in the Network Product Marketing Department at Sun Microsystems in Mountain View, Calif. . . .

Joseph D'Ambrosio is managing director of the Taylor Simpson Group, a real estate investment concern in New York City. He is married and has two children. . . . **Sue Bidstrup** lives in Atlanta, Ga.

Keith Byerly is a technical marketing manager at Hewlett-Packard's Medical Products Division in Waltham, Mass. . . . **Randy Cook** serves in the U.S. Navy aboard the aircraft carrier *USS Independence*. . . . **Nora Fong** lives in southern California, where she does medical research. . . . **Julie Neuringer** enjoys her research fellowship at the Brigham and Women's Hospital in Boston. . . . **Kennita Lane Watson** is running an active campaign as the Libertarian Party candidate for secre-

tary of state of California. Kennita says, "This leaves little else, but I am still running my mail-order button business and trying to squeeze my ju-jitsu classes into the cracks."—**Lynn Radlauer Lubell**, secretary, 2380 NW 41 St., Boca Raton, FL 33431, (407) 997-2097

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Thanks to **Mike Collucci** for a nice long letter catching us up on the doings of he and his wife Teresa (Cichello), '84, and lots of our classmates. Mike and Teresa bought a house in Saginaw, Mich., last year and had their first child, Joseph Michael, last October. Mike, still working in consumer products research for Dow, is involved in community issues such as solid waste disposal. He'd like to hear about other classmates involved in this issue (I am, Mike!). . . . In February, the Collucci family trekked to Los Angeles and visited with Lou Jandura, '84, Roy Weinstein, '83, and **Maria Dawson**, who was getting ready to join her husband Bill in Boston. Then it was up to the Bay area to visit with **Mark Taylor**, **Jason Kaldis**, and **Gary Feder**. Mark reports that Jason is working and finishing his master's in architecture and that Gary is back in school, working on a PhD at Berkeley.

Keith Sawyer also dropped a note to say that he's been managing the New York office of CMD (Consultants for Management Decisions), working on corporate applications of artificial intelligence technology. After a hectic year working in New York and living in Cambridge, Keith decided to return to academia. By now he's at the University of Chicago pursuing interdisciplinary research in physical anthropology.

More babies: **Dean Koutsoubis** and his wife, Barbara, sent an announcement of the birth of Michael Dean, born last April 19. . . . **John Hollis** and his wife, Cheryl, became the parents of Russell Thayer last January. The Hollis family will be returning to the United States from Nairobi some time around November.

Jeffrey Lukas completed his residency in pediatrics at the University of Connecticut Health Center last summer and is now paying back his Air Force ROTC commitment at Altus Air Force Base in Oklahoma, which Jeffrey reports is flat and windy and has "no seafood, salt water, or trees." He married Lauren Ann Blazousky in July 1989.

Mark Szara is working for IBM in Lexington, Ky.

Dexter Charles is vice-president of the Chase Manhattan Bank Risk Management Group. His wife, Lisa, is an assistant district attorney with the Brooklyn District Attorney's office. . . . **Kent Massey** reports that he is taking life one step at a time and enjoying himself more than ever after the company he started went down the tubes and took all of his money with it. Kent is now working as an independent consultant and says, "I'm in hock up to my eyeballs."

Apologies to **Whay Lee** for saying (in the July column) that he "claims" to be an honorary resident of Ashdown House. The Ashdown House constitution provides for honorary membership to be conferred on "individuals who have rendered distinguished service to Ashdown House," and Whay has been accorded that honor by unanimous vote of the Ashdown House Executive Committee.

Keep those cards and letters coming in to East Coast correspondent **Linda Schaffir** (50 Aiken St., No. 512, Norwalk, CT 06851), West Coast correspondent **Michelle Gabriel** (656 S. Fair Oaks Ave., D-211, Sunnyvale, CA 44086) or me.—**Stephanie Pollack**, 135 Sutherland Rd., Brighton, MA 02146

83

We received a scenic postcard from **Jean-Joseph Cote**, who lives in Arlington, Mass., but sent the

Mitch Kapur: People Should Come After Survival, But Before Profits

Before he launched Lotus Development Corp., Mitchell Kapur, '81, had taught transcendental meditation, was a disc jockey and a mental health counselor in a hospital, and later based his routine as a stand-up comic on his hospital experience—a "long adolescence," he says, that focused entirely on people and their problems.



In fact, at one point, he applied and was admitted to the Massachusetts School of Professional Psychology. But a chance purchase of an Apple computer turned his life around. "I fell in love with the machine, and the day after I bought it, I had an epiphany about my role in the field of human services: I could make my greatest contribution to the field by getting out of it."

Ironically, four years after leaving Lotus and three years into his new venture, ON Technology in Kendall Square, Kapur was at the Massachusetts School of Professional Psychology to tell graduates "that what it ultimately takes to be successful has to do with understanding people" as much as with innovations like the Lotus 1-2-3 spreadsheet program.

"Business relationships can be every bit as searing and painful as personal relationships," Kapur told the graduates last spring. And he believes that "interpersonal relationships in the business world increasingly determine the quality of emotional life" for adults.

In good times, Kapur observed, organizations can afford to be paternal, cultivating a sense of family and community. The real tests come when a business faces turbulent markets or the transition from struggling start-up to mature enterprise. Then "survival has to be rule number one," Kapur admitted, when the manager is "forced to discard the feelings of the individual for the sake of such business ideals as cash flow, return on investment, earnings per share, and market penetration."

Under such pressures, when egos

are shattered and lives are thrown off course, Kapur insists there is still a place for balance, understanding, fairness, and respect.

"Profits and people are not mutually exclusive," Kapur argued. "Organizations that consistently put their profits ahead of their people eventually discover that they have neither."

"You can't create value without having

values. Organizations need to be more concerned about integrity and honesty less for reasons of pragmatism than because it's the right thing to do."

Having said all that about the responsibilities of organizations, Kapur also had something to say about the responsibilities of employees. Too many Lotus hires, in his opinion, viewed the company as "a corporate welfare state with all these higher-level, cradle-to-grave benefits: generous salary, stock options, the company shuttles, child care, flextime, etcetera. That wasn't the deal. The deal was: you put in a lot, you get out a lot. These folks completely misunderstood the social contract."

Kapur found such greedy self-interest hard to take. "If you've invested a lot of yourself to build something that didn't exist before, it's impossible to be dispassionate about it," he confessed.

And if the pressures in the business world are high now, Kapur said, wait until tomorrow. "We will see the restructured, faster-paced, and highly competitive world marketplace subject people to pressures that are far more intense and demanding than today."

To his audience of psychologists, many of whom "are going to be working with the casualties of business organizations," Kapur had a special message: take advantage of every opportunity you have "to help organizations strike better tradeoffs between their desire for profits and their desire to provide a humane business environment."

"If you do your work well, your contribution to the health of this country will be incalculable." □

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Robert G. Croy,
Ph.D. '79
Emily DeVoto
Timothy L. Lash,
B.S. '87
Stephen G. Zemba,
S.M. '85, Ph.D. '89
Matthew Pilkington
Ph.D.
Susan A. Sundstrom
Ph.D. '87
Sarah Armstrong
medical consultants
Kerry L. Blanchard,
M.D., Ph.D.
David E. Golan,
M.D., Ph.D.

card from San Diego. He was out there for the U.S. long-orienteeing championship, which is cross-country running while navigating with map and compass. Jean-Joseph came in fourth, and he met other alumni Larry Berman, '55, and Vicki Woolworth, '81.

John Roberts is vice-president in charge of K.W. Muth Co.'s Advanced Technologies Division, working on head-up displays and other innovations for the OEM auto market. The Roberts family bought a house and moved in June. . . .

Bruce Campbell recently started a job with the Office of Management and Budget in the executive office of the president, working on space transportation and space technology issues. . . .

Robert Cox has been a process support engineer with Applied Materials since September 1988, traveling throughout the United States and to Taiwan, Korea, and Canada to facilitate semiconductor equipment start-up operations.

Rosalinda Hernandez uses her Course II planning skills in developing a support/study group for work-at-home mothers with young children. . . .

Karl Levy works on new product development at Applied Materials in Santa Clara. Karl spent most of 1989 on assignment in Osaka, Japan. . . .

Ray Schnitzler lives in Piscataway, N.J. He just left Bellcore, where he was working on high speed data communications, to join AML/Samsung in Lawrenceville, N.J., where he will work on video consumer electronics. . . .

Thomas Sherlock heads PC software development at Wolfram Research in Champaign, Ill.—**Jonathan Goldstein**, secretary, TA Associates, 45 Milk St., Boston, MA 02109

84

Karen Welch finished business school a while back and has had fun since then. She visited **Amy Smith** in Botswana last fall and stopped by Victoria Falls. She is now at GM as a manufacturing general supervisor. . . . **Jeff Collett** is a post-doc at the Institute of Atmospheric Physics in Zurich, Switzerland. . . . **Mark Kolb** is an aeronautical engineer at the GE Research and Development Center in Schenectady.

I received a postcard from a member of the Boston College class of 1928. The sender was bemused by a statement by **Carl Adams** regarding his squandering of taxpayers' money at NASA. A joke, though taken quite seriously by this gentleman. Everyone will be happy to know that Carl plans to pursue a doctoral degree at Stanford, having left the squandering business. . . . **Vivian Wang** was worried that the postcard she sent me would make its way into this column. It did. Vivian has switched jobs and works for a new architectural firm in New York. She was recently visited by Denise and **Dennis Sacha** who were making a sweep of the country before heading off on assignment to Spain.

Jeff and Ann Berner are the proud parents of Christena Jean, born in May. By now, the Berners should be in Japan on assignment for Boeing. Marci and **Wayne Greene** are doing well in California, riding out the shakes and dealing with the drought. Wayne has expanded his pursuit of chemical engineering into the making of homemade beer.

Wayne reports that **Paul Gjording** is engaged to Nancy Maham, with the wedding planned for Labor Day weekend. . . . **Oren Levine** sent electronic mail from Israel, where he works for Indigo, Ltd., a photocopying and printing company. Oren is becoming a computer jock in the CAD department. He returned to work after four months in the army, followed by a trip to the United States that included a stop at Tosco's in the student center.

I attended the Class of '85 reunion events with my wife Lori, '85. The gala at the Children's Museum was a lot of fun, but I'll leave the details to my fellow secretaries.—**Howard Reubenstein**, secretary, 38 Belknap St., Somerville, MA 02144, (617) 625-9299, hbr@ai.mit.edu

85

We had a record attendance for a 5th year reunion: The predicted attendance was 50 classmates and 27 guests and the actual was at least 103 classmates and 30 guests. There's more reunion news (and pictures) in a class newsletter which everyone should receive shortly. The new class officers are **Inge Gedo**, president; **Alex Menchaca**, executive vice-president; **David Libby**, vice-president for programs; **Anita Killian**, treasurer; **Stephanie Winner**, administrative secretary; **Bill Messner**, secretary (class notes); **Mike Candan**, member-at-large; **Michael Bernard**, member-at-large; and **David Fung**, agent. The office of secretary was split so that Bill writes the notes. I've enjoyed it, but the next five years will be very busy for me since I am expecting to have a baby in November.

Alec Atkin writes that he had an exciting week, part of which was spent hunting for fireflies with the chairman of the board at her son's house in the hills. They did well, catching about 20 to 30. The farmer flooded his rice field behind Alec's "mansion" (that means a new apartment in Japan). The same day the ducks flew and the frogs hopped in. Now it's kind of noisy at night. . . .

Will Sauer changed jobs last March, moving from metallurgical research at the Bureau of Mines in Albany, Ore., to Smith and Nephew Richards in Memphis, Tenn. He is a technology development engineer, applying the latest advanced technologies to Richards's orthopedic products. This is much more along the lines of work he was hoping for. It's stimulating, challenging, and most of all, motivating. He brought his girlfriend, Casey Barney, to Memphis and she is now his fiancée. She is working on a computer programming degree at Southeast Technical College. There's a sort of anti-academic attitude in that part of the country, but the thunderstorms are great. Will is out of triathlons, but back into tennis, golf, and bowling.

Robert Malchman graduated last year from the University of Michigan Law School and passed the Massachusetts and New York bar exams over that summer. For the past year Robert served a clerkship with Judge David A. Nelson of the United States Court of Appeals for the Sixth Circuit in Cincinnati. The court hears cases on appeal from federal trial courts in Michigan, Ohio, Kentucky, and Tennessee, so there is a good mix of cases and styles of lawyering. The work is interesting and not too onerous, and he suspects it may be the best job he'll ever have. When his clerkship ended, Robert planned to take six to eight months off to travel around the world, and then to work for Gibson, Dunn & Crutcher in New York, where he worked during the summer of '88.

Chris (Clements) Lyons, '86, gave birth to her and **Mike Lyons** first child, Chelsea Kathleen Lyons, on June 6. They live in Webster, N.Y., and work for Xerox. . . . **Elizabeth Johnson Barnes** is a management consultant with Price Waterhouse. She had her and her husband James's first child in July.

Richard Corkran works as a pilot for Pan Am. . . . **Robert Gandara** attends graduate school at Georgia Tech. . . . **David Todd** is at the University of Chicago, working on his PhD in chemical physics. He has had one paper published with another on the way. He gave a talk in Anaheim, Calif., in May and is hoping to graduate someday. . . . **John Swartz** is working on his PhD in electrical engineering at Dulce. He spends his spare time building for Habitat for Humanity and is active in the UV fellowship. His wife Kim (Wellesley '85) has left IBM and is going back to school to get her MD. They plan on being at the 10th reunion. . . . **Brad Haas** received his MD from Baylor College of Medicine in Houston on June 4. He is now doing a transitional internship for a year with Stanford University at the Santa Clara Valley Medical Center. Following that he will do his residency in anesthesiology at Har-

vard during the next three years. . . . **Thomas St. Louis** is a chemical production supervisor in the Erythorbic Dept. at the Groton, Conn., site of Pfizer, Inc.'s Chemical Division. He completed his MBA at RPI in May. . . . **Yancy Dennis** graduated in May from the University of Virginia with a PhD in chemical engineering. He accepted a position with DuPont as a consultant engineer in the Reaction Engineering Group.

Please send your news to—**Bill Messner**, secretary, 3320 King St., Berkeley, CA 94703 internet: messner%cmlds6@ucbarpa.berkeley.edu

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Hello again! **Bob Henshaw** writes in from Los Angeles. He recently returned to the U.S. after two months in Australia, where he was working at the University of Sydney's Royal North Shore Hospital. After Bob received an MD from Tufts University School of Medicine last May, he began a residency in orthopedic surgery at the UCLA Medical Center. He will be there for one year of general surgical internship followed by four years of orthopedics. Bob shed some light on some of his fraternity brothers of Phi Beta Epsilon: **Jeff Wang** and **George Fan**, '85, are receiving MBAs from the UCLA School of Business. . . . **Howie Shiel** graduated from the MIT Practice School with an MS in chemical engineering and now works for Exxon in New Jersey.

Eric Clayberg and **Karen Wohl** graduated from Harvard Business School this year. Eric is currently a partner in a small start-up company that is building software for Wall Street investment banks (\$2+ million in contracts so far). Sounds pretty successful. Karen will be returning to Merrill Lynch in New York City after she returns from touring the West Coast. She spent some time visiting **Ellen Epstein** in Seattle and doing some sightseeing in Canada. We expect Karen down here in L.A. soon, so we can head to Ensenada for a few days of R&R. Ellen is working for Microsoft over the summer before she returns to Wharton Business School.

Douglas Roth graduated from NYU School of Medicine in May. He will be staying at NYU to study in their general surgery program, which was his first choice. Doug says he really misses sailing on the Charles in the spring. Don't we all! . . . **Andy Solem** graduated with an MS in aeronautics from the University of Tokyo in March 1989. He is currently the lead Air Force engineer for the U.S.-Japan FSX fighter program at Wright-Patterson AFB, Ohio. . . . **Fred Johnsson** is working for a small start-up company developing various laser-based medical devices. He is also living in Vermont and competes regularly in cross-country skiing and cycling.

David Anderson gained an associate membership to the AIAA Technical Committee on Automation and Robotics. . . . **John Port** writes in from Baltimore, Md., where he is living as a happily married man. John says PhD research (he didn't say what kind) leaves little time for exploring, but they still manage to enjoy themselves. . . . **Rick Russell** hosted an alumni barbecue in Burbank for the fourth annual Beaver Cup Hockey game vs. Caltech. MIT Alumni won 6-1. Almost 100 alumni showed up for the event including **Dale Archer** and **Corky Penny**, '87. Members of the team included Pete Gasparini, '88 (Indiana), **Dennis Clarke**, '84 (N.J.), **Heinrich Kochling**, '84 (Boston), **Buzzy Dale** (Ariz.), and **Brian Fabes**, '84 (Ariz.).

After being at MIT for almost eight years, **Sergio Ajuria** is looking forward to getting that third and final degree, the PhD (in materials science) at the end of next year. He will also be getting married in August to **Stephanie Easterday**, a Wellesley grad. . . . **Robert Sabo** graduated from Jefferson Medical College in June and got married, also in June. He started his one-year general surgery internship in Philly to be followed by a residency in neurologic surgery at UFI in Peoria, Ill. (beginning next July).

Marian Sackler had time to catch up with **Joy Hussain** and **Bosco So** and their stories about the Peace Corps and being in Lesotho and Liberia. She also met **Dan Bodor**, '85, who is a radiology resident in Dallas at University of Texas Southwestern. As for Marian, she will soon be starting her internal medicine residency in Minneapolis/St. Paul. . . . **Peter Ulrich** is a jet flight instructor for the Navy, along with his roommate **Dave Koch**. Pete says that between their time as students and their instructor tours, they've been incarcerated in Beeville, Tex., for nearly three years. However, within the next 10-11 months, they'll both be assigned to fleet squadrons on either the West Coast or the East Coast.

Lianna Cleland got married last March to **David Kalmar** (Princeton, '84). They will move to New York City upon her graduation from Yale Law School in May 1990. . . . **Albert Amzallag** emigrated to Australia from France in January 1988 to be with his wife. (He got married in 1987 in Frejus, France and they now have a son.) In Australia, Albert has been working in sonar systems engineering for Thomson Sintra Pacific, a subsidiary of Thomson Sinto ASM.

Of all the nights in the year, **Karl Tucker** and I both picked the June 9 to have parties. **Mark Emineth** showed up at mine (must have been the lure of the margaritas). Mark works for Engineering Research Associates, which is part of E-Systems out in Washington, D.C. Haven't heard from Karl since he called on the 8th to tell me about his party. I'm sure it was almost as successful as mine. WRITE!—**Mary C. Engebret**, secretary, 1800 Hermosa Ave., No. A, Hermosa Beach, CA 90254

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Denise Neirinckx Sacha and her husband **Dennis**, '84, moved in April to Rota, Spain. Denise writes that Spain is wonderful, but about 20 years behind. (It can take two years to get a telephone installed.) "The weather is gorgeous. People are really friendly. The food is good. Beaches are wonderful. It's a very pleasant and relaxed way to live." Denise and Dennis live off-base and drive a Spanish wreck (car). Denise is looking for a heavy-duty mechanical engineering job. They'll be in Spain for three years.

Randi Rubin married **Glenn Protter** on June 3 in New Jersey. Randi works at Merck. Present at her bridal shower were **Liz Carducci**, **Eileen Cannon**, **Mary Minn**, **Yeal Zheng**, **Blair Cohen**, '88, **Karen Nelson**, '88, and **Julie Safirstein**, '88. . . . **Tom Hoffman** will be at Harvard Business School in the fall, where he joins **Mintoo Bhandari**. . . . **Ted Devlin** is back from a three-year stay in London and now works in Cambridge.

The last news is about myself. After graduating from the Kennedy School of Government with a Master of Public Policy degree, I took a job in New York City government. I work at the Taxi and Limousine Commission as assistant director of administration, and I live on the Upper West Side.—**Stephanie Levin**, secretary, 393 West End Ave., Apt. 10B, New York, NY 10024

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Many apologies to **Michael Cohen** about the wedding announcement. Apparently he was as surprised to hear about his August wedding as were his friends. He was, however, leaving his job at Cambridge Systematics and plans to travel around Europe for a month. Then he will be moving to southern California to begin a master's program at UC/Irvine. He used to share a Brookline apartment with **Martha Soto**, who is working on a doctorate at Harvard in biology. . . . **Alan Szarawarski** is also at Harvard working on a doctorate in political science and spent his summer in Poland.

Alan Fullerton attended **Bill Wegerer**, '87, and **Susan Dittmar**'s wedding in Edina, Minn., in

April. . . . **Todd Barber** was among the many MIT guests. . . . **Tupper Hyde** married **Laura Highstone** (Wellesley, '88) in June. They now live in Malden, Mass. . . . **Kim Thompson** is engaged to **Kamran Badizadegan**. Kim is starting her PhD at Harvard School of Public Health. Kamran is at the HST Program at Harvard Med. Congrats to all.

Ben Spehlmann is investigating the use of catalysts in gasoline blending. . . . **David Oberman** is working on a PhD in materials science and engineering at Stanford. His research is on molecular beam epitaxial growth of compound semiconductors. . . . **Alice Chow**, **Emi Ishida**, **Paohua Kuo**, and **Rick Vinci** are other '88ers in the Stanford MSE Department. . . . **Charles Animalu** is working with a computer design group at Anambra State University of Technology in Nigeria.

Chad Raymond writes from Somerville. He is "still without a permanent job and is tending to pay rent." . . . **Marty Scheidl** is part of a group producing a 1991 photo-calendar to benefit AIDS. . . . **Joel Simansky** left General Dynamics and now works for a small company near St. Louis that produces balsa wood model airplane kits. He puts new products through various flight tests, one of which is nicknamed the "telephone pole test." . . . **Dave Glassner** and his Virginia sweetheart, **Michelle**, are busy planning their upcoming wedding. . . . **Mike Russell** visited Boston from Cornell for the Boston Marathon. He finished in 4 hours and 42 minutes.

Scott Lichtman has recently returned from a year at the London School of Economics and another year at the Science Policy Research Unit, outside Brighton. He really enjoyed his graduate research on "telecommunications deregulation and corporate collaboration." He also had the opportunities to see France, Belgium, and the Soviet Union. He rounded up his old bandmates for "Vital Science" after returning back to Boston. They played one late evening in WMBR's studios. From the band, **Kevin Peterson** is trying to finish up an MIT master's (through the VI-A program), and lives in Somerville. . . . **Gary Leskowitz** and **Eric Ostling** are living together, also in Somerville. Eric is finishing a commissioned, post-modern composition for an MIT chamber performance group. . . . **Andy Hong** is working at the Media Lab at MIT.

Dimitry Ritschev is trying to start his own company developing high-tech for foreign language learning products. It's been a joint project with **Cary David**, his housemate to date. . . . **Raghu Krishnaiah** lives with **Mark Wick** and **Lawrence Shing** in Mountainview, Calif. . . . **Terry Fong** is still seeing **Jessica**. . . . **John Bulzachel**'s 6A master's thesis took longer than usual, so he's now back at MIT taking courses.

Barbara Sannwald is increasingly pleased and has moved up (assistant project manager) in her job with Oracle. She is also studying jazz piano. . . . **Eric Heels** has been in Finland working through Air Force ROTC piloting school. That's all folks! Let's keep those letters coming. Note new address: **Grace Ma**, secretary, 545 1st Ave., No. 9H, New York, NY 10016

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Well, I got a lot of news from the Alumni Office this time, a few cards, and no e-mail! I did notice a typo in my e-mail address in the most recent *Review* (July at this writing), so that might explain things. I hope everyone's summer has gone well; please write and tell!

I have already been reading about our classmate's business ventures in the business pages. Thursday, May 17, saw the unveiling of "a small Massachusetts company's" two prototype solar-assist cars. Although the sun refused to cooperate, Solectria Corp. project manager **James Worden** took the four-seat "Sunrise" and sporty "LightSpeed" through their paces. In the drizzle, James held a drawing of the sun over the cars,

and joked with photographers to encourage them to use their flashes.

Francis K. Poirier was recently promoted to manager, while retaining the title of senior consultant and assistant national director of Management Consulting Services at BDO Seidman in San Francisco. Francis is a contributor to a recently published book, *The New York Times Financial Guide To The 1990s*, authored by Gary Klott, a former tax reporter with *The New York Times*. Francis, recently divorced, is finding San Francisco beautiful.

K. Tibor Toth was working as an analyst for Drexel Burnham Lambert in their Boston Corporate Finance Office from February 1989 until their recent collapse (Did you get any of that \$300 million bonus?). Tibor is now working as an associate with Berkshire Partners, a leveraged buy-out firm in Boston, and has crossed paths with **Earl Yen**, **Juli Lee**, and **Kevin Foote**, all of whom also work in the downtown Boston area. . . . **Ann (Herrmann) Mailhot** married **John N. Mailhot**, '88, in August 1989. Ann is currently a grad student in the Ceramic Engineering Department at Rutgers. Ann and John own a cat, named after Toscanini's Ice Cream.

Comprising 8 percent of the population of Montezuma, Colo., the highest incorporated town in the U.S. (elevation 10,400 feet, population 15) is **Gigi Richard**. Gigi has a year appointment with the Keystone Center's Science and Public Policy Program, an environmental conflict management firm. . . . **Theresa Brennan** is working towards a master's degree fabricating Schottky diodes in the semiconductor device lab at the University of Virginia. Theresa was in Ireland for St. Patrick's Day, and had a great time. . . . **Yau W.E. Yu** is in the first year of the MD program at the University of Toronto.

Alice Biber and **Charlotte Biber** will be working in Switzerland for a year, after which they will probably return to the U.S. Alice was in San Francisco for a plant trip, and saw **Elizabeth Greyber** (now at Stanford med), **Angeli Salgado** (who will be going to the Philippines soon), **Steve Payne** (who is working at Tektronix in Portland), and **Ed Kim** (who was visiting Steve). Steve, Alice, and Charlotte went mountain biking to the top of Mt. Tamalapai in Marin County. I also got a call from Ed, who reports that he has been working hard (90-100 hour weeks—that's what I call working hard!) at Prudential Bache. Occasionally, he gets a week with under 50 hours (whew!). Ed has an apartment in Queens and has been hanging out in jazz clubs in the West Village. Ed has a two-year position and will be going to B school soon.

John "Pahty" Martin attended a party for Deke's 100th anniversary at MIT and forwards some information about some of his Deke brothers. **Bill "Bib" Puglia** is currently deciding what job offers to take after receiving a graduate degree. He is still in South Boston and doing fine. . . . **Jerry "the Snowman" Stoller** is out in Arizona at Motorola. . . . **Steve "Kelly" Stoller** has been leading Deke into its first B-league softball championship. Steve is at Draper sometimes and is working on a graduate degree in mechanical engineering. John reports that he has been "making the transition from Boston's wild college scene to becoming a sedate yuppie here in southern Connecticut." John frequently gets back to visit MIT and Simmons.

As for myself, I'm back at MIT now, after spending a year working in the Optical Computing Department at Bell Labs. Just one of the fun things I've found about the New Jersey shore in the summer is the bountiful musical theatre, and I had the opportunity to play the part of Mark in the Spring Lake Theatre Co's production of "A Chorus Line." But now it's time to play the part of a grad student living in Central Square. Please note the address change (the old one is still valid, however), and drop me a card about your summer!—**Henry Houh**, secretary, 14 St. Paul St., No. 2, Cambridge, MA 02139, e-mail: tripleh@athena.mit.edu



COURSE NEWS

I CIVIL ENGINEERING

Peter Kalustian, SM '34, sends word from Boonton, N.J.: "My international consulting engineering practice and travel still continue very actively in the field of food fats, oils, and derivatives. As well as the United States, recent clients are located in Australia, Malaysia, Italy, and Mexico. I enjoy the challenge, satisfaction, and new friendships. I intend to continue my practice and to date, my health has continued to be very good. I keep very active with my industry professional societies. Since my wife's demise in 1978, I want to keep fully occupied. As for my recreation, I am well on my way to qualifying as a downhill 'ski bum.' This past season I enjoyed some 64 days of skiing in New Jersey, New York, Vermont, and elsewhere. I am a member of the ever-growing '70 Plus Ski Club' with some 6,500 member worldwide. Our club president and others pushing 90 years of age still ski, so at my 79 years young, I have a lot of good ski years left. This is especially so since my 16- and 15-year-old grandchildren really enjoy skiing, and I want to continue to keep up with them. In summer, my recreation is motor boating, swimming, and just plain walking. I am very fortunate in that my daughter and her family live next door and my son and his wife live in lower Manhattan, so I can see them frequently. Thus, I am well taken care of."

James V. Hamel, SM '66, of Hamel Geotechnical Consultants, Monroeville, Pa., was named "Pittsburgh Civil Engineer of the Year" by the Pittsburgh Section, American Society of Civil Engineers, at its annual meeting in May 1990. Hamel has practiced as an individual consultant in geotechnical engineering for the past 17 years. He has worked on projects related to landslides, dams, foundations, engineering geology, and waste disposal throughout the United States, Canada, and overseas. . . . **William E. DuVall**, SM '76, has been appointed project executive for Gilbane Building Co.'s Mid-Atlantic Regional Office. In his four-plus years with Gilbane, DuVall has held several positions in the field of project management.

II MECHANICAL ENGINEERING

Sankaraiyer Gopalakrishnan, ScD '69, writes: "I was promoted to the position of VP for research & technology of the Pump Division at BW/IP International, Inc., last January." . . . **James R. Bledsoe**, ME '65, was promoted to robotics lab manager at Boeing Aerospace Operations. They are contractor to the Kennedy Space Center Design Engineering Directorate. . . . **Joseph K. Ting**, SM '74, sends word: "I was elected as president-elect of ASHRAE (Northeastern New York Chapter) last April. Last March, I was appointed to serve in the Refrigeration Committee of ASHRAE as liaison in an information exchange with the international organization to inform ASHRAE of international development concerning global environmental issues such as CFC/ozone depletion and greenhouse warming." . . . **P. Ranganath Nayak**, ScD '68, is now senior VP at Arthur D. Little, Inc., in Cambridge, Mass. He was formerly director of corporate marketing at ADL.

Markus I. Flik, an assistant professor in Course II, has been named the holder of the

Lynde and Harry Bradley Foundation Career Development Chair. The foundation administers a national program which funds higher education and public policy research. Flik, a native of Stuttgart, West Germany, received his PhD at UC Berkeley. His research interests include thermal stability of superconducting electronic devices, thermal radiation properties of high-temperature superconducting films, and heat transfer in the processing of thin-film semiconductors and superconductors. It is Flik's primary goal to combine the engineering methods of heat transfer and thermodynamics with basic results from solid-state physics and electrodynamics. . . . **Robert H. Cannon, Jr.**, ScD '50, of Stanford University, has been named a Fellow of the American Academy of Arts and Sciences.

Three MIT Course II alums have been elected to the National Academy of Engineering. **Marvin E. Goldstein**, SM '62, chief scientist, NASA Lewis Research Center, was recognized for outstanding theoretical contributions in the areas of aerodynamics, acoustics, and unsteady aerodynamics for advanced aerospace propulsion systems.

Stephen C. Jacobsen, PhD '73, professor of mechanical engineering, research professor of bioengineering, and research associate professor in the department of surgery at the University of Utah in Salt Lake City, was honored for engineering artificial kidneys, the Utah artificial arm, robots, and micro-motors, and for successful commercial implementation of advanced products. **John H. Sununu**, '61, chief of staff to President Bush, was honored for outstanding achievements in energy systems development, in engineering education, and in integration of technological advances with public policy.

Navy Lieutenant **Mather K. Waltrip**, SM '89, recently graduated from the Engineering Duty Officer School. During the six-week course, Waltrip received training related to the engineering plans, programs, policies, and procedures used by the Navy throughout the life cycle of its ships and systems. . . . **Richard F. Salant**, professor of mechanical engineering at the Georgia Institute of Technology in Atlanta, has been named a Fellow of the American Society of Mechanical Engineers (ASME). . . . **Adrian Bejan**, '71, J.A. Jones Professor of Mechanical Engineering at Duke University, has been selected by ASME as the 1990 James Harry Potter Gold Medalist for "his original and unorthodox ideas, journal articles, textbooks, graphics, and lectures demonstrating that engineering thermodynamics is an active and often controversial field of research, and for encouraging others to invest their creativity in the future of the field."



W.F. Schilling

III MATERIALS SCIENCE AND ENGINEERING

Davis S. Fields, Jr., ScD '57, sends word: "Early retirement from IBM Corp. came after 23 years as a senior engineer. I have served as professor of mechanical engineering at Colorado State University on a part-time basis since 1985. I have four grandsons under four." . . . **George Foo**, ScD '77, writes: "I am now manufacturing & engineering director for the AT&T computer factory in Little Rock, Ark." . . . **Richard W. Hertzberg**, SM '61, has been honored for 25 years of service at Lehigh University in Bethlehem, Pa. He is department chair and the New Jersey Zinc Professor of Materials Science & Engineering and is also director of the mechanical behavior lab of Lehigh's materials research center. Hertzberg specializes in fatigue and fracture of metals and polymers. He is the recipient of many grants and awards including Lehigh's Joseph F. Libsch Faculty Research Award and the Alcoa Foundation Award, and is a Fellow of the American Society for Metals.

Phil Tobin, PhD '68, senior member of the Technical Staff in the Semiconductor Products Sector of Motorola, Inc., Austin, Tex., has been named a Dan Noble Fellow. This award, which recognizes technical creativity, innovative ability, and productive achievements, is given annually to those Motorola technologists singled out by management as having made significant contributions. . . . **John E. Watton**, ScD '87, is the new chair of the department of mechanical engineering at Lawrence Technological University in Southfield, Mich. Watton has served on the Lawrence Tech faculty since 1988 and helped develop the University's new master of engineering in manufacturing systems (MEMS) degree program. . . . **William F. Schilling**, ScD '69, has been appointed executive VP of Autoclave Engineers Group in Erie, Pa. Schilling will be responsible for all business operations of Autoclave, a producer of high-pressure valves as well as reaction equipment and systems for the catalysis, chemical, petroleum, pharmaceutical, and polymer industries.

John E. DeMoss, SM '42, of Middlefield, Mass., died on April 19, 1990. He worked for 22 years at General Electric Co. in Pittsfield, chiefly as a component specialist, and retired in 1980. He had been a member of the finance commission, a police chief, and an assessor, all in Middlefield. DeMoss was a member of the National Society for Metals, the Sigma Xi Society, and the National Rifle Association.

IV ARCHITECTURE

Takashi Arioka, SM '86, sends word from Kanagawa, Japan: "I joined the SE Design Institute as a partner in charge of environmental design last May. The institute was established in 1987, and now is composed of departments of editorial design, graphic design, and environmental design." . . . **Donald F. Ritter**, SM '88, writes: "I have just completed my first year as an assistant professor of fine arts at Concordia University in Montreal, Canada. I am continuing my development of music-controlled animation systems and have presented interactive performances in New York, Chicago, Toronto, and Verona, Italy, over the past year." . . . **David Curt Morris**, MAR

'71, reports: "I am teaching computer-aided design at MFA graduate department at the School of Visual Arts in New York City. Water sculptor: using high and low pressure water; water behavior experiments, with bronze and stone." . . . **Sebastian A. Gray**, SM '88, writes: "I am working as an architect for the Urban Design Unit of the City of Boston's Public Facilities Department (affordable housing on city-owned vacant land). I'm also teaching third year studio at the Boston Architectural Center."

Astra Zarina, MAR '55, sends word from Rome, Italy: "My recent activities include: Inauguration of renovation, restoration and furnishing of two floors of a baroque palace in Rome—Palazzo Pio—seat of the University of Washington's Rome programs (1989); several trips to Berlin as consultant for a large project which I completed in 1970, now subject to additional work (1989); Graham Foundation Grant awarded for project regarding Pliny the Younger's Laurentine Villa—project, exhibit, lecture, and catalog completed in collaboration with University of Washington Department of Classics (1989); This year marks the 20th anniversary of the University of Washington Architecture in Rome programs, which I founded and have directed since 1970 (1990); and this fall, I have been invited to lecture at the School of Architecture in Riga, Latvia—my native city (1990)." . . . **Shubhankar T. Sanyal**, SM '83, writes: "I have been a computer-aided-design consultant for architects for the past year and a half. I have also been seeking active participation in various affordable and low-income housing projects, housing rehabilitation, and designing prototypes for retail stores all over the country."

Peter Droege, MAA '78, visiting lecturer in Urban Studies & Planning at MIT, has recently won three commendations in the 1990 AIA Photography Competition. The selected photographs were taken in Japan, Egypt, and Yemen and will be on display at this year's national AIA convention in Houston, Tex.

William L. Demiene, MAR '57, was recently elected to a three-year term on the board of directors of Albert Kahn Associate, Inc., Detroit architects and engineers. Demiene joined AKA in 1974 after 17 years' experience with other architectural firms, including 8 years as principal of his own firm. He was named a senior associate and chief of architectural design in 1975 and a VP in 1988. . . . **Lisa Hescong**, MAR '78, and her family have moved to Sacramento. She is designing schools with Stafford King Associates. Her husband, **Douglas E. Mahone**, '72, is working for ADM Associates as director of architectural research and is still specializing in building energy efficiency. "Our kids have made it to 4th and 1st grades and are thriving," they report.

V CHEMISTRY

Mark A.K. Patterson, PhD '82, writes: "I am presently finishing my first year of a pediatric residency at the University of Virginia, Charlottesville. I was also recently commissioned as a captain in the Air Force, with the plan to work for them as a pediatrician upon completion of the residency." . . . **William E. Ohnesorge**, PhD '56, professor of chemistry at Lehigh University, was recently honored for 25 years of service. Ohnesorge specializes in analytical chemistry. He served as associate dean of the College of Engineering and Physical Sciences from 1982 to 1984. . . . **Gerald D. Laubach**, PhD '50, of Pfizer, Inc., New York, N.Y., has been elected to the American Academy of Arts and Sciences.

Andrew Myers, '81, assistant professor of chemistry at California Institute of Technology, has been named a Sloan Fellow. According to a Caltech press release: "His research interests involve the synthesis and study of complex organic molecules, where a major focus is the development of methods to synthesize these compounds

in the lab. Frequently, these molecules possess important biological properties such as anti-tumor or antibiotic activity. Myers and his research group have determined the complete molecular structure of one such antibiotic, neocarzinostatin, and their work has helped elucidate the basis of its anti-tumor activity. They are now working to discover the molecular basis of other antibiotics and to develop synthetic analogs that mimic, or improve upon, the properties of the original drugs." He was awarded a Dreyfus Foundation Distinguished New Faculty Award in 1986, and received both a Presidential Young Investigator Award and a Packard Fellowship in 1989."

VI ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Charles A. Zraket, SM '53, of the Mitre Corp. in Bedford, Mass., and **Raymond S. Stata**, '58, of Analog Devices, Inc., in Norwood, Mass., have been elected to the American Academy of Arts and Sciences. . . . **Ralph Cicerone**, '65, has been elected to the National Academy of Sciences. His research focuses on the chemistry of the atmosphere. He has published notable papers on stratospheric ozone, the role of certain gases in Earth's energy budget and climate system and the origins of atmospheric methane. Presently he is professor and founding chair of the new Geosciences Department at the University of California at Irvine. . . . The Science and Technology Foundation of Japan has awarded Course VI Professor **Marvin L. Minsky** a 1990 Japan Prize worth \$320,000. . . . The National Academy of Sciences and the National Academy of Engineering have convened the Manufacturing Forum, a new standing committee that will assess public policies and programs and private-sector actions affecting U.S. manufacturing performance. The Forum is composed of senior government officials and leaders from the private sector with corporate, labor, and academic experience. **Paul E. Gray**, '54, is among the 15 members.

Mordecai D. Katz, SM '53, and his wife, Dr. Monique C. Katz, were presented with Yeshiva University High Schools' (YUHS) Dor LDor (Generation to Generation) Award in recognition of their "abiding dedication to Torah education." Mr. Katz is an attorney in private practice in Englewood and his wife is associate professor of clinical radiology and attending physician at the Columbia-Presbyterian Medical Center in New York. . . . **George F. Providakes**, '71, has been named department head of D96, UHF/SHF Satellite Communications at Mitre Corp. He was formerly associate department head. Providakes has an extensive background in advanced satellite communications technology and system engineering, gained on the Milstar program, as well as hands-on experience as a communications officer with the U.S. Army. He will also be project leader for the GMF/NABS satcom project. . . . Purdue University has awarded an honorary doctor of science degree to **H.Y. Fan**, ScD '37, professor emeritus of physics at Purdue since 1978. He be-

gan his 30-year association with Purdue in 1948, and was appointed Duncan Professor of Physics in 1963. Fan's years at Purdue were marked by pioneering research and a series of scientific advances that have come to be regarded as milestones in condensed matter physics and semiconductor research. He gained a worldwide reputation for the originality of his ideas and his relentless pursuit of scientific truth, according to a Purdue news release.

Peter Alexander, PhD '71, has become president of Spartacus, Inc., in Lowell, Mass. He was formerly the technical director of Numerix, a company he founded in Newton, Mass. . . . **Stephen W. Lang**, '77, has received a Lockheed Sanders book award for an article entitled "Frequency Estimation from Phase Differences." The paper was published at the 1989 IEEE International Conference on Acoustics, Speech & Signal Processing in Glasgow, Scotland. . . . *Energy Aftermath: How we can learn from the blunders of the past to create a hopeful energy future* (Harvard Business School Press, 1990), is a new book co-written by **Thomas H. Lee**, MIT professor emeritus, **Ben C. Ball, Jr.**, '48 (X), director of MIT Integrated Energy Systems Project, and **Richard D. Tabors**, assistant director of the Lab of Electromagnetic & Electronic Systems.

John O. Morin, SM '56, of Hingham, Mass., died on May 2, 1990. Morin was an electrical engineer for Sigma Instruments in Braintree, Mass., for 20 years. . . . The Alumni/ae Association has been informed that **David J. Whitney**, '37, of Bristol, N.H., died on May 28, 1989. There was no further information provided.

VI-A INTERNSHIP PROGRAM

As this is being written in mid-June, I have just returned from an historic meeting in Huntington Hall (10-250) where our 15th president-elect of MIT was introduced to the faculty and staff. Dr. Charles M. Vest was warmly welcomed with a prolonged standing ovation as he arrived with an entourage including former MIT presidents Jerome B. Wiesner and Howard W. Johnson, current President **Paul E. Gray**, '54, and Corporation Chair **David S. Saxon**, '41. Dr. Vest and Dr. Wiesner both hail from the University of Michigan. It is interesting to note that, of MIT's fourteen presidents, only three have had MIT degrees: **Julius A. Stratton**, '26, James R. Killian, '29 (XV), and Gray.

June 4th saw the close of the academic year with Commencement. The annual Awards Convocation for achievements during the year, at which a number of VI-A's were honored, was held May 14th. The Goodwin Medal, for "conspicuously effective teaching by a graduate student," went to **Franklyn A. Turbak**, '86. One of the Graduate Student Council Teaching Awards went to Professor **Stuart E. Madnick**, '66, of the Sloan School of Management. Recipients of Henry Ford II Scholar Awards included **Joseph R. Babiec, Jr.**, '90, and **Timothy Rueger**, '91. Joe also competed successfully for a Marshall Scholarship and will spend the fall at the London School of Economics.

The annual EECs Department Social & Awards Ceremony was held at the Boston Museum of Fine Arts on May 20th, at which Department Heads **Fernando J. Corbato**, PhD '56 (VIII), & **Paul L. Penfield** presided. The Ernst A. Guillemin ('24) Award for outstanding undergraduate thesis went to **Brian A. LaMacchia**, '91, who also received the David Chanen ('86) Prize given to a computer science undergraduate for excellence in writing.

The George C. Newton ('41) Award for the best laboratory project went to **Theodore R. Pascaru**, '89; and a Departmental Special Meritorious Award went to **Pankaj Oberoi**, '92, for his running of the 6.270 contest during IAP '90.

Receiving the Frederick C. Hennie III ('55) Award for outstanding teaching was **Tracy M. Clark**, '83.



H.Y. Fan



S.W. Lang

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Beverly A. Hjorth
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Craig K. Leon
Darlene Vanstone
Brian Michaels
Daniel Bourque

Technical Specialist
Russel Weinzimmer

Of Counsel
Alfred R. Johnson, '35
Joseph Zallen, '39

Another VI-A undergrad, **Alice A. Chang**, '90, achieved the New England Championship Fencing Crown at Brown University last February, and led the MIT women's team to a final third-place finish.

In professional activities, nominated for Elected Committeeman of the Executive Committee of the Boston Section, IEEE, is **David E. Meharry**, '71. Dave is with Lockheed-Sanders where he's manager of MMIC & Microwave Applications in their Microwave Technology Center.

The week of alumni/ae activities brought a number of visitors to the campus with whom I had contact. In from Colorado Springs, Colo., was **Louis A. Nagode**, SM '81, and family. His wife had alumnae activities at Wellesley College. Louis visited the VI-A Office where we had a wonderful reunion. He is a systems engineer with Cadre Technologies. He flies the company plane covering their Utah, Colorado, New Mexico, and Arizona territories.

At the Technology Day Luncheon I had a pleasant chat with **Cecil H. Green**, '24, was here to meet with his friend Virgilio Barco, '43 (I), who gave the commencement address. Mr. Green will be celebrating his 90th birthday this July. He still has a keen interest in the VI-A Program and our students at Texas Instruments, Inc. I also spoke, in passing, with **L. Dennis Shapiro**, SM '57, and saw **William E. Northfield**, SM '57, in the audience. Another pleasant chat was with "Doc" F. Leroy Foster, '25 (III), former Lowell School Director, who's now succeeded by VI-Ar **Bruce D. Wedlock**, ScD '62.

The oldest class alumnus attending the Tech Day Luncheon was **Robert A. Warren**, '15 (a Course VI grad) and the photo staff got him and this year's graduate, **Joe Babiec**, '90, (Class of '90 president and a VI-Ar) together for an historical picture which later appeared in *Tech Talk*.

One of the winners in this year's 2.70 contest was **Christopher M. Mayer**, G. He will join seven other winners on a trip to Tokyo Institute of Technology this summer for a special competition where each will be paired with a student from TITECH.

Recent contact with other VI-Ars includes: a card from **John F. Cooper**, SM '76, on a business trip to Charlotte, N.C., for Personics Corp. (Redwood City, Calif.) where he is VP for Manufacturing; a visit from **Michael D. Ernst**, '89, who's engaged to a senior at Wellesley College with summer '91 wedding plans; a nice luncheon at Legal Seafood with **Stephen M. Foster**, SM '90, who's working in the Boston area; and a chance meeting with **Steven D. Levy**, SM '86, and wife at a Wellesley restaurant where I often have lunch on Saturday, who've bought a new home in Wellesley. Steve is with the Putnam Fund of Boston.—**John A. Tucker**, Director (Emeritus) VI-A Internship Program, MIT, 77 Mass. Ave. Rm 38-473, Cambridge, MA 02139.

VII BIOLOGY

Christian Siebel, G, and **Mark Bix**, G, graduate students in Course VII, have been named winners of the Yaichi and Masako Ayukawa Fellowship Award and of the Ayukawa Travel Fellowship, respectively. The Fellowship Award will enable Siebel, who is with the lab of Professor **Donald Rio**, to pursue his work in a biochemical project concerning the splicing of messenger RNA and to travel to Japan to explore developments there in this field. The Travel Fellowship will allow Bix, who is associated with Professor **David Raulet**, PhD '82, to attend a professional meeting in Japan on immunology, his area of research, particularly the shaping of the mature T cell repertoire. The awards, which were announced by the MIT Japan Program, were made possible through a gift from Yaichi Ayukawa, '52, (XX) the president of Techno-Venture Co., Ltd., a venture capital firm in Tokyo. . . . **Paul R.**

Schimmel, PhD '67, professor of biochemistry and biophysics at MIT, has been elected as a member of the National Academy of Sciences. . .

Alexander Rich, the William Thompson Sedgwick Professor of Biophysics, Course VII, has been elected to the Institute of Medicine.

Stephen Buratowski, PhD '90, Associate Professor **Leonard P. Guarente**, '74, Professor **Phillip A. Sharp**, and **S. Hahn** have all contributed toward an article that *The Scientist* has termed a "Hot Paper." "Five intermediate complexes in transcription initiation by RNA polymerase II," which appeared in *Cell* 56, 549-61, (24 February 1989), was listed as "receiving a substantially greater number of citations than others of the same type and vintage." In an attempt to explain why, Buratowski said: "This paper describes the application of native-gel electrophoresis to the problem of transcription initiation by RNA polymerase II and its accessory factors. This technique allowed us to identify several new preinitiation complexes and to view the initiation reaction as a series of relatively simple intermediate steps. The results led to the proposal of a detailed model of the protein-DNA and protein-protein interactions within the initiation complex, and to preconditions about the specific functions of individual factors. The model has been successful because it not only fits the data in the paper, but also builds upon and consolidates diverse findings from other researchers and other experimental approaches in the study of transcription initiation."

Preventing a Biological Arms Race (MIT Press, 1990), edited by Susan Wright, "is a timely sourcebook [that] presents the essential technical, political, legal, and historical background needed for informed judgments about the recent expansion of military interest in the life sciences—particularly in the weapons potential of the new biotechnology," according to the book jacket. **Jonathan King**, professor of molecular biology and director of the Biomedical Electron Microscopy Lab at MIT, and **Harlee Strauss**, research affiliate at the Center for Technology, Policy, and Industrial Development, co-contributed a chapter entitled "The Hazards of Defensive Biological Warfare Programs." King's scientific research is in the area of protein folding and the genetic control of virus assembly.

VIII PHYSICS

Bajirao V. Gokhale, PhD '51, writes: "I recently retired from a three-year teaching stint at the George Mason University in Fairfax, Va. I plan to retire to Greenfield, Mass., in the near future." . .

Raymond A. Patten, '58, head of the Applied Optics Branch in the Naval Research Lab's (NRL's) Optical Sciences Division, was presented the Department of the Navy's Meritorious Civilian Service Award. Patten was honored for "his major contributions toward improving the survivability of Navy aircraft and for his role in the operational employment of electro-optical and infrared countermeasure systems." . . . **Karl D. Brommer**, SM '88, has received a Lockheed



K.D. Brommer

Sanders book award for two published articles: "High Level Language Programming for Avionic Vector Processors" and "Calculation of Ground States for Many-Fermion Systems."

J. David Litster, PhD '65, professor and director of the Francis Bitter National Magnet Laboratory, has been elected to membership in the American Academy of Arts and Sciences. . . . **Arthur V. Phelps**, ScD '51, of the Joint Institute for Laboratory Astrophysics has been named the recipient of the first APS Will Allis Prize. The citation reads, "In recognition of his leadership in the field of gaseous electronics, as evidenced by definitive pioneering studies of electron, ion, and atomic collision processes, calculations of electron transport and energy flow in ionized gases, and applications to newly developing technology areas such as gas lasers."

Two 1990 Sloan Fellow: recipients are **Jacqueline N. Hewitt**, PhD '86, and **Simon G.J. Mochrie**, PhD '85. Both are assistant professors in MIT's Department of Physics and each will receive a grant of \$25,000 for a two-year period. . . . California Institute of Technology has its own MIT alum 1990 Sloan Fellow: **Nai-Chang Yeh**, PhD '88, assistant professor of physics, and he, too, will receive a \$25,000 grant. . . . **Solomon J. Buchsbaum**, PhD '57, senior VP for technology systems at AT&T Bell Labs, has been selected to receive the Arthur M. Bueche Award for "his leadership in promoting mutual understanding concerning science and technology among leaders in universities, industry, and government and for rendering insightful technical advice to five U.S. presidents."

Dorothy Weeks, PhD '30, of Newtonville, Mass., died on June 4, 1990. Weeks was a physicist whose career as an educator and researcher spanned nearly six decades. She was the first woman to receive a PhD in mathematics at MIT. On retiring from Wilson College in 1956 after 26 years as a professor and head of the physics department, Weeks joined the Ordnance Materials Research Office of the Watertown (Mass.) Arsenal as coordinator of a project that developed radiological shielding material for use against nuclear weapons, neutrons, and gamma rays. She left the arsenal in 1964 to become a spectroscopist, studying solar satellites at the Harvard Observatory. She retired in 1976 when she was 83. Meanwhile, she was a lecturer in physics at the Newton College of the Sacred Heart from 1966 to 1971. In addition, Weeks held several different jobs. She was an assistant examiner in the U.S. Patent Office, an assistant in the National Bureau of Standards, an MIT physics lecturer, a supervisor at Jordan Marsh in Boston, and during World War II she spent two years in Washington with the government's Office of Scientific R&D.

Robert Noyce, PhD '53, of Austin, Tex., died of a heart attack on June 3, 1990, at age 62. Noyce, who revolutionized electronics as an inventor of the semiconductor, was working to revive American chip-making as head of the government-industry consortium Sematech at the time of his death. Working separately in the late 1950s, Noyce and Jack Kilby invented the integrated circuit, which made rapid gains in computer technology possible by putting the power of multiple transistors on a single chip. The Silicon Valley pioneer also was one of the founders of Intel Corp., the nation's third-largest semiconductor producer, and fought for the creation of a consortium to promote the American industry. In 1988, Noyce was appointed CEO and president of Sematech, which was set up to help the United States recover world leadership in semiconductor manufacturing. . . . The Alumni/ae has been notified that **Donald L. Jarrell**, SM '57, of McLean, Va., died on December 3, 1989. There was no further information provided.



K.K. Hsiao

IX BRAIN AND COGNITIVE SCIENCES

Karen Hsiao, PhD '81, has been named a recipient of the Charles E. Culpeper Foundation Scholarships in Medical Science for 1990. Through this award Hsiao will receive \$100,000 a year for three years to fund her research at the University of California in San Francisco, where she is currently assistant professor in the Department of Neurology. Hsiao's research will focus on the investigation of molecular genetics of inherited human prion diseases in order to better understand the mechanism by which transmissible cerebral amyloidosis occurs.

X CHEMICAL ENGINEERING

John L. Espy, SM '47, sends word: "I retired from my position as professor of international business and associate director of MBA Programmes at The Chinese University of Hong Kong in October 1988 and left Hong Kong in August 1989. Mrs. Espy and I are now retired and living in Topeka, Kans." . . . **Michael J. Abadi**, SM '78, reports from Boco Raton, Fla.: "I am president of ICL Corp., manufacturers of coated and laminated textile fabrics. Our products include PVC coated knits, woven fabrics, and water repellent nylons and polyesters." . . . Word from **Carlos Paya**, SM '59, in Madrid: "Early retirement from the presidency of Repsol. Since January 1990, I've been consultant director at Geslink. Our main activity is merging, acquisitions, and intermediations." . . . **En Sup Yoon**, PhD '82, is department chair and associate professor in the Department of Chemical Engineering at Seoul National University in Korea.

Carl A. von Ende, SM '34, sends word from Spokane, Wash.: "I retired in 1974, after 40 years (less four with the Navy during WW II) in the pulp and paper industry—to which I was introduced at the Bangor Practice Station. I enjoyed immensely the "Chemical Engineering Report to the Alumni," particularly the reminiscences of Doc Lewis, Tom Sherwood, Hoyt Hottel, Mac McAdams. They, with Charlie Cooper and Freddie Adams, introduced me to chemical engineering a la MIT." . . . **Denise (Carter) Laws**, SM '80, sends word from Fairfield, Calif.: "I am a staff engineer specializing in process control computer systems administration and support for the Exxon Corp.'s Benicia Refinery. I am married with two daughters, ages 1½ and 3."

Chong Y. Yoon, SM '59, has retired as VP of the chemical division at the Upjohn Co. in Kalamazoo, Mich. . . . **Joseph J. Paterno**, SM '65, is VP for manufacturing in Bonded Abrasives at Norton Co., Worcester, Mass. He was VP for manufacturing in Organic Grinding Wheel at the same company.

Adel F. Sarofim, ScD '62, an authority on combustion and radiation, has been named the Lamont du Pont Professor of Chemical Engineering. Sarofim is noted for his work with energy and the environment and for his research on radiative heat transfer, furnace design, applied chemical ki-

netics, and air pollution control. He succeeds **Raymond F. Baddour**, ScD '51, who has retired, as holder of the chair. Sarofim has been a member of the faculty of the Department since 1961. . . . **Phillip R. Westmoreland**, PhD '86, assistant professor of chemical engineering at the University of Massachusetts, has been named a 1990 Presidential Young Investigator by the White House and the National Science Foundation. The award recognizes and encourages outstanding promise in mathematics, the sciences, and engineering with a five-year grant of up to \$500,000. . . . **Paul M. Cook**, '47, of Raychem Corp., Menlo Park, Calif., has been honored with election to Fellow of the American Academy of Arts and Sciences.

XI URBAN STUDIES AND PLANNING

Alan C. Weinstein, MCP '79, sends word: "In August 1989, I joined the faculty at Cleveland State University where I hold a joint appointment in the Cleveland-Marshall College of Law and the Levin College of Urban Affairs. I also serve as director of the Law & Public Policy Program, a joint undertaking of the two colleges." . . . **Jane Harris**, SM '89, writes: "I am working in San Francisco for AMB Investments, Inc., as a corporate real estate advisor. The company is active in three lines of business: investment management, corporate real estate, and real estate development." . . . A note from **Fang Chang**, '89, in Taipei, Taiwan: "I came back to my office on September 2, 1989. I still work in the Council for Economic Planning and Development."

XII EARTH, ATMOSPHERIC AND PLANETARY SCIENCES

Roger Little, SM '64, president of the Bedford-based Spire Corp., was given the John Ericsson Award in Renewable Energy by the U.S. Department of Energy. Spire is one of the world's leading producers of photovoltaic manufacturing equipment and process technology. The Ericsson award is named for John Ericsson, whose experiments in the late 1880s formed the basis for modern work with solar power. As the winner of the award, Little will receive a gold medal and a \$10,000 cash prize. . . . **Peter Molnar**, senior research associate in Course XII, has been elected a new member of the National Academy of Sciences.

Roger Mather, SM '40, writes: "I have published the third and final volume of my three-volume series, *The Art of Playing the Flute*. Vol. I was published in 1980 and Vol. II was published in 1981. I am (and have been since 1977) adjunct professor in the School of Music at the University of Iowa." . . . In an effort to help U.S. companies compete more effectively in world markets, the National Academy of Engineering and the National Academy of Sciences have convened the Manufacturing Forum, a new standing committee that will assess public policies and programs and private-sector actions affecting U.S. manufacturing performance. One of the ex officio Forum members is **Robert M. White**, ScD '50, president of the National Academy of Engineering.

XIII OCEAN ENGINEERING

Professor **T. Francis Ogilvie**, head of the department, has been named the first recipient of the William H. Webb Medal for "outstanding contributions to education in naval architecture, marine, or ocean engineering." The medal's namesake, Webb, founded and endowed the Webb Institute of Naval Architecture in 1899, the nation's only private, tuition-free engineering school in the marine field. Ogilvie has been with

Harvey Gantt

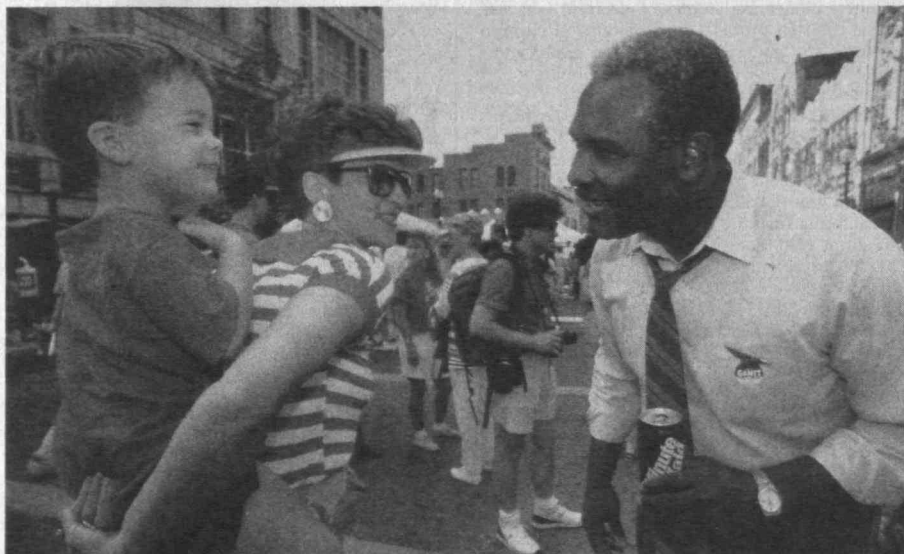
An Architect of the New South?

Webster's defines *chiaroscuro* as "pictorial representation in terms of light and shade without regard to color." It is a term that usually refers to art—paintings in particular—but one could also apply it to a rather unusual political contest taking place this year between an MIT grad and a son of the Old South. In North Carolina, former Charlotte mayor Harvey Gantt, MCP '70, has taken on Republican Senator Jesse Helms, who is seeking his fourth term in office. In his bid to represent a more modern, progressive South, Gantt maintains that Helms' extremist stances have obscured the real problems facing their state and the nation. A more striking contrast of light and shade—without regard to color—is not to be had this political season. And when you add the color, the palette—and the ballot—take on even more intriguing dimensions.

Jesse Helms is a familiar figure to anyone who pays even minimal attention to the national news. An icon of the far right, he has spent his 18 vocal years in Washington championing conservative causes from school prayer and anti-communism to prohibitions against abortion and funding for the arts. The scourge of many and hero to a host of others, he has been viewed by friends and foes alike as invincible. But the times are changing and his challenger is seen as a leading symbol of that change.

Harvey Gantt is an architect and a community activist, a singer in his Baptist church choir and an ardent tennis player. His early childhood was spent in a public housing project in Charleston, S.C.; by working three jobs, his father was able to buy some land and build a house by hand, with Harvey helping. The "promise of America" that he grew up with—and now sees threatened—is a central theme in Gantt's campaign. "I think in America, too many people don't have that belief that they can make it," he observes. "Even people who work hard every day see diminishing returns on their effort. We can't lose that as a country. As poor as we were, we were always conscious that things were getting better."

The first black to attend Clemson University—thus ending South Carolina's holdout as the last state with segregated schools—Gantt earned a BS in architecture, studied urban planning at MIT, and then joined an architectural firm in



Harvey Gantt, MCP '70, of North Carolina campaigning for the U.S. Senate.

Charlotte, N.C. After co-founding his own firm, Gantt Huberman Architects, in 1971, and serving two and a half terms on the city council, he ran for mayor of Charlotte. Defeated in his first primary, Gantt tried again a few years later and became the first black to hold the post, winning nearly 40 percent of the white vote in a city that was only one-quarter black.

And all the while he was juggling private practice and politics, Gantt maintained his ties to the Institute, serving on the Educational Council, twice on the Corporation Visiting Committee for the School of Architecture and Planning, and as a regional gift solicitor for the Alumni Fund. As mayor he sent two people from Charlotte to participate in the Community Fellows Program at MIT, a non-degree program for mid-career minority professionals in community development. One of the fellows from Charlotte developed a scholarship program for public housing residents, and the other worked on a latch-key program for kids home from school without supervision.

According to Mel King, adjunct professor of urban planning and director of the Community Fellows Program, Gantt has a very good grasp of needs—the need for housing, for decent jobs and schools, for health care. Gantt charges that his opponent has neglected those needs in favor of the "hot button" issues. "Mr. Helms has managed to grab headlines on public funding for the arts, but I have never seen

him champion the cause of a decent health-insurance program for the working people of North Carolina," Gantt said when announcing his candidacy last winter. "He has spent a lot of time invading the privacy of people's bedrooms, but I have never heard him speak to parents of this state about the high cost of teenage pregnancy, child abuse, and high infant mortality. He spends a lot of time defending right-wing dictators in Central and Latin America and South Africa's apartheid, but how much time has he spent improving the quality of education of North Carolina's children?" The state ranks last nationally in high school SAT scores and first in infant mortality rates.

In addition to the one quarter of North Carolina whites historically not expected to vote for a black candidate under any circumstances, there's another, more centrist, slice of the electorate. It consists of those who don't always agree with Helms but indicate they like him for his plain-spokenness—people who say they at least always know where he stands. Unlike Helms' previous challengers, Gantt from the start hasn't hesitated to take strong stands and stick by them. Now those voters (Republicans and "Jesseocrats" alike) have a clear-cut choice between two people who don't waffle on the issues.

According to MIT's Associate Head of Urban Studies and Planning Phillip Clay, PhD '75, Gantt is attracting a number of middle-of-the road groups who simply

find Jesse Helms too negative. Whereas Helms has spent considerable effort over the years emphasizing what we ought to fear—be it communists, homosexuals, liberals, flag burners, or feminists—Gantt can't seem to resist looking at the brighter side: what works, how to make the most of the potential in individuals and the nation. Referring to the candidates' different approaches to voter appeal, Mel King mused, "Harvey will bring out the best in us; Jesse tries to bring out the beast in us."

During his two terms as mayor, Gantt was known for his managerial and cheer-leading abilities—getting people fired up and working together in sometimes unlikely coalitions. "We want people to get excited about this election," Gantt said of his race for the Senate. "We want them to be driven crazy by the notion that they can make a difference. We want a crusade." King, who is working to turn out the public housing vote in North Carolina, commented on Gantt's energy, presence, and vision. "There's a really good spirit around his campaign," King said. "It's a campaign of challenge, a campaign of hope."

Clay, who studied with Gantt at MIT, describes the candidate as thoughtful, hardworking, and personally persuasive. Gantt himself offers a refreshing assessment on how he's changed in his 15 years in politics—including his narrow defeat for a third term as mayor from which he learned about the dangers of complacency. Besides becoming more assertive on the issues, he observes, "I've become more sensitive to the fact that Harvey Gantt's views are not the only ones there."

Gantt's ability to think creatively and to pull people together instead of setting them off against each other just might start to permanently alter the balance of light and shade in the political landscape of the South—and the rest of the country as well. Mel King, among others, has noted Helms' disproportionate impact on public policy issues—a factor contributing to the national interest in this particular campaign. Two of Gantt's biggest obstacles, Helms' \$6 million war chest and what King terms a natural tendency for people to vote for what they think they can get rather than what they really want, may not be insurmountable. "Times have changed," says Gantt, "Jesse Helms hasn't." North Carolina now wields a pivotal paintbrush. □

MIT since 1982. Earlier in his career, Ogilvie was recognized for his research in hydrodynamics, especially the mechanics of water waves and their interactions with ships and other floating objects. In addition to his contributions to academia, Ogilvie provided a guiding hand in the establishment of the School of Naval Architecture and Marine Engineering at the University of New Orleans.

Coast Guard Captain **James Card**, SM '70, was the subject of an article in the San Pedro, California, *News Pilot*. Card, who is captain of the ports of Los Angeles and Long Beach, commander of the 11th Coast Guard District Marine Safety Office, and head of marine inspections for Southern California, recently picked up another job as on-scene coordinator for the Huntington Beach oil spill cleanup. On February 7, 1990, the *American Trader* hit something and was leaking oil. Among other things, within the first hour, Card had a helicopter dispatched to the sight and set up a "strike team." Huntington Beach Mayor Tom Mays was quoted as saying, "He did an excellent job handling the crisis."

Captain **Leslie E. Richardson**, SM '35, USN (Ret), of Alexandria, Va., died on April 26, 1990. Richardson spent 20 years in the Navy before retiring from active duty in 1949. For the next decade, he was executive director of the Episcopal Church Society for College Work. He then taught at St. Stephen's School in Alexandria for about a year. From the late 1950s to the late 1970s, he was an investment counselor for several firms before retiring from Sade & Co. . . . Captain **John D. Crowley**, NE '57, CG (Ret), of New London, Conn., died on April 21, 1990. While at MIT, Crowley was awarded the Karl Taylor Compton Prize. He became a member of the Permanent Commissioned Teaching Staff at the Coast Guard Academy in 1963 and in 1970 was appointed head of the Department of Physical and Ocean Sciences, a position he held until his retirement from the Coast Guard in 1978. He later became associated with CDI Marine in Groton, Conn.; the Bath Iron Works Corp., Bath, Maine; and Specialized Systems, Inc., Mystic, Conn. He was a member of numerous societies and associations.

XIV ECONOMICS

Bedros P. Pashigian, PhD '60, writes: "I have become editor of the *Journal of Business*, published by the Graduate School of Business at the University of Chicago." . . . **Whitney Newey**, PhD '83, has been granted tenure and promoted to full professor in the Department of Economics at Princeton University. Newey, who has been a visiting assistant professor at Carnegie-Mellon University and a research fellow at the University of California, Berkeley, became an associate professor at Princeton in 1988. A fellow of the Econometric Society and a member of the editorial board of *Econometrica*, Newey studies nonparametric and semiparametric estimation with applications to sample selection models and consumer surplus estimation.

Oliver Blanchard, PhD '77, MIT professor of economics, has been honored with election to membership in the American Academy of Arts and Sciences. . . . **Robert S. Gibbons**, assistant professor in Course XIV, has been selected as a 1990 Sloan Fellow. A \$25,000 grant will be administered to him through MIT for the next two years. **Rudiger W. Dornbusch**, the Ford International Professor of Economics at MIT, was among the committee of distinguished scientists who reviewed the more than 500 nominations for these 1990 Sloan Fellows.

XV MANAGEMENT

Barbara Dalton Russell, SM '77, writes: "After having my second child, Peter, I established my

GAZETTE

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own consulting firm, Cove Hill Consulting. * Although my leading client, Reuters, keeps me much busier than the perfect 'part-time' job I had envisioned, I'm not complaining." . . . **Nanette E. Hartley**, SM '81, sends word: "After working on Jim Florio's successful gubernatorial campaign, I joined the New York Chamber of Commerce and Industry as VP of Member & Business Programs. It is an absolute joy to work with some of the most talented businesspeople in the world in developing policy and programs in tax policy, domestic and international trade, education, economic development, and other challenges and opportunities in the New York business community." . . . **David E. Finnell**, SM '87, joined Eli Lilly and Co. as manufacturing analyst last January. . . . **William O. Schach**, SM '50, is retiring as senior resident VP of Merrill Lynch after 39 years.

William J. Kane, SM '82, has moved from associate to general partner at Harvest Ventures, Inc., in New York, N.Y.

Scott E. Butler, SM '81, is associate director at Bear Stearns Companies Inc., in New York, N.Y. He was first VP at Drexel Burnham Lambert, Inc., also in New York. . . . **James K. Schmidt**, SM '74, is managing director at Freedom Capital Management Corp. He was working for Tucker Anthony Management under the same title. Both companies are in Boston.

In an effort to help U.S. companies compete more effectively in world markets, the National Academy of Engineering and the National Academy of Sciences have convened the Manufacturing Forum, a new standing committee that will assess public policies and programs and private-sector actions affecting U.S. manufacturing performance. One of the 15 forum members is **John S. Reed**, '61, chair and CEO at Citicorp.

The Alumni/ae Association has been notified that **Joyce D. Waye**, '75, of Boston, Mass., died on September 25, 1989. She had participated in the Urban Executives Program; no further details were provided.

Seminar XXI: Pentagon Goes Back to School

It's the first Monday of January, and you've just stepped into a historic, brick-faced house in downtown Washington, D.C. Inside, you've found a room of about 40 senior military officers, CIA analysts, congressional committee staff members, bureaucrats from the Departments of Energy and State, and private sector industrial managers. They are listening intently as a woman with a no-nonsense manner leans forward in her high-backed chair. "Let's think about paradigms," she says. "Dick Samuels has outlined several paradigmatic descriptions of Japan: cultural; the Japan Inc. model, which has some similarities to liberal interest-group pluralism; and the late-development model, which has some Marxist similarities."

You've joined a meeting of Seminar XXI, an MIT-run program designed to encourage innovative thinking among "future leaders of the national security community" by immersing them in academic analyses of foreign policy problems faced by the United States. Seminar XXI began in 1986 as an experimental education program for senior military officers and quickly expanded its constituency. Seminar fellows are nominated by their respective services or departments and chosen for the program by a committee of MIT faculty.

The program was the brainchild of Political Science Head and Ford International Professor Suzanne Berger in conjunction with Mitzi Wertheim, manager of advanced development programs at IBM and formerly deputy undersecretary of the Navy, and Jake Stewart, a former senior Navy official who is now a management consultant.

For many of the participants, this is the first time in years they have been in an academic setting, but the level of discussion is uncompromisingly high. Each meeting is devoted to a particular topic—the Soviet Union, Western Europe, Latin America, trade and technology. The format includes presentations by two scholars—both considered world experts in the requisite field and chosen because they represent contrasting perspectives—followed by questions and discussion.

The structure of the seminar underlines Berger's central message: every



For four years Political Science Department Head Suzanne Berger has run a Washington-based seminar designed to help officials in the U.S. military, government, and industry understand the complexities involved in interpreting international situations.

situation can be interpreted from multiple viewpoints. The more views her students can take of a situation, the greater will be their "flexibility of thought," Berger contends, and the more options for response they will perceive.

Berger's favorite tools are "paradigms," political science models that form theoretical frameworks for possible perspectives on each given situation. Berger emphasizes three traditional paradigms: cultural, liberal/neo-classical, and Marxist. The cultural approach examines the effect of traditional social structures, such as religion, language, and family, on the functioning of a society. Liberal/neo-classical paradigms stress the effect of individual political and economic activity on shaping a society as a whole. Historical analysis of subjects like ruling class oppression and income inequality is the basis of the Marxist paradigm.

Berger runs each session with considerable finesse, introducing the guests for their introductory lecture and then fading into the background until the question period. Even then,

she lets the guests take questions, slipping back into the discussion thread only when it threatens to go too far afield.

Tonight, the speakers are MIT Professor Richard Samuels, PhD '80, founding director of the MIT-Japan Science and Technology Program, and Koji Watanabe, deputy foreign minister of Japan and principal negotiator for Japan in last year's Strategic Impediment Initiative talks between his country and the United States. Watanabe has agreed to speak candidly provided he is not quoted in the press—one of the many occasions on which Berger has been able to bring seminar fellows not only diverse but behind-the-scenes views.

Samuels is assessing possible cultural and economic explanations for Japan's economic success. Many Japanese believe their success derives from their origin as a "chosen" people. *Nihonjinron*—the study of Japanese uniqueness—is a popular pastime. "In a Tokyo bookstore, you can find several feet of shelves devoted to the study of Japanese bones, the Japanese brain, or Japanese aerobic power," Samuels

says. Taken to extremes, *nihonjinron* descends to the crude idea that racial purity equals racial superiority. A more sophisticated and less racially charged analysis shows, however, that the Japanese have been able to focus their practices and attitudes—their “national will”—toward common goals much better than most nations.

One possible cultural explanation for these shared goals lies in the notion of “traditional society”—extended families and tightly knit villages, for instance. In a larger sense, these ties reflect what Samuels calls “the superordination of groups.” Japanese stress social values like stability over individual economic gain, trading obedience to social superiors for benevolent rule. The flaws with this explanation, Samuels says, lie in its suggestion that these traditional values are somehow “organic” to Japan, and that leadership and ideology don’t matter.

In fact, Japanese elites have historically used culture as a tool to shape their society, Samuels says. The nineteenth-century Meiji reformers, for instance, restored the Japanese emperor as a figurehead in a successful attempt to employ traditional symbols to legitimize needed industrial change. Modern Japanese culture obviously reflects such manipulations: the notion that corporate firms should be surrogate families was created by entrepreneurs who wanted to prevent labor mobility.

What we see as modern Japan, sometimes ironically called “Japan, Inc.” is a “countervailing dynamic” of mutually dependent power blocs—business groups, politicians, and bureaucratic officials—who rely on each other for jobs and financial support while directing the nation’s economic growth. Some westerners attribute the origins of Japan, Inc. to the farsighted influence of elite reformers, while others credit the “late development model,” the idea that late industrialization incurs such heavy costs that the state must assume a leading role in directing development.

Samuels’ analysis illustrates both the strengths and the weaknesses of the paradigmatic approach. Multiple explanations of a complex subject offer different bases for developing strate-

gies. On the other hand, paradigms can be overly restrictive. Berger, whose obvious paradigmatic passion occasionally raises chuckles from the participants, sometimes tries too hard to fit a particular perspective into a pre-

*“It was a
real eye opener
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decision makers
to be better
informed.”*

established paradigm. In this case, Samuels quickly objected when she attempted to shoehorn the Japan, Inc. model into the liberal paradigm of “interest-group pluralism,” pointing out that the Japanese system has very little in common with the enlightened self-interest posited by the liberal paradigm.

The seminar fellows are obliged to sort out the issues for themselves, and they don’t always enjoy the mental exercise. One Army colonel complained that “sometimes it would be nice if we could come to a conclusion about things” instead of batting paradigmatic descriptions back and forth. The perfectly human desire to find a neat, definitive “conclusion” is, of course, precisely the pitfall Berger is trying to train these students to avoid. The best they should realistically expect is to develop enough understanding of complex, fluid situations to take constructive action.

One State Department analyst found the most fascinating aspect of the seminars to be the detail they provide about what was actually taking place during certain crises. “It was a real eye-opener to learn how little was actually known at the time,” she said. “You expect decision makers to be better informed.”

Seminar XXI meets nine times during the year, including two weekend retreats at the Wye Plantation on Maryland’s eastern shore. The program is funded largely by fees charged to the

participants’ organizations, which cover costs for course materials, meals, and lodging. Grants from private foundations, such as the Rockefeller and MacArthur Foundations, and a generous start-up grant from Harry Kalker, ’23, make up the remainder.

Did Reagan Campaign Hold Up Release of American Hostages?

Pity poor Bernard Lewis. Not because the distinguished former Princeton scholar failed to deliver an engaging Seminar XXI presentation on the historical development of Islamic government, nor because he didn’t explain how that development has led so many Islamic states to violently reject Western-style modernization (he did both). No, pity Lewis because he was upstaged in an unexpected coup by Gary Sick, the National Security Council expert on Iran during the Carter administration.

Sick, who monitored the Iranian hostage crisis for the Carter administration, ended up dropping a bombshell on a Seminar XXI assembly of military, diplomatic, and corporate officials. His thesis: the Reagan campaign “stole” the 1980 election by secretly promising arms to Iran in exchange for a delay in releasing the American hostages.

A tall, serious man in his mid-50s, Sick defies the stereotype of trendy leftist out to discredit Reagan’s presidency. His 1985 book on the hostage crisis, *All Fall Down: America’s Tragic Encounter with Iran*, was widely praised as a fair and meticulous retelling of the frustrating, exhilarating, and ultimately doomed negotiations for the hostages’ early release. “From day one” there were rumors that the Reagan team had been dealing secretly with the Iranians, Sick said. “I used to pooh-pooh such rumors. I don’t do that anymore.”

“My presentation tonight may be somewhat controversial,” Sick began. “It represents the results of my previous nine months of research. Everything that’s accumulated so far can no longer be ignored.” What followed would have warmed the hearts of most conspiracy theorists. Stitching together a narrative from “an intriguing sequence of events” he said he had veri-

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Douglas G. Gifford, '71
Joseph J. Rixner, '68
John P. Dugan, '68
Kenneth L. Recker, '73
Mark X. Haley, '75
Robin B. Dill, '77
Andrew F. McKown, '78
Keith E. Johnson, '80
Elliott I. Steinberg, '80
Deirdre A. O'Neill, '85
Chris M. Erikson, '85
Gretchen A. Young, '86
Christian de la Huerta,
'87

fied, Sick described six years of collusion and betrayal, secret arms shipments and stealthy meetings, deception, lies, and treason—a lengthy tale of foreign policy shaped by a quest for personal political gain.

In the summer of 1980, he said, many Reagan campaign officials were worried that Carter would secure the release of the hostages in an "October surprise" that would restore his credibility and win him the election. "I don't believe it would have worked that way, but the level of fear and paranoia in the campaign was extremely high." The real action began at the Republican convention, when a senior Republican official reportedly told the Israeli ambassador, "If you can help us with the hostages, you'll have the most pro-Israeli administration in history." The "help" they had in mind, Sick said, was getting the Iranians to agree not to release the hostages until after the election. An initial contact between the Reagan campaign and an Iranian led to further encounters, culminating in a series of Paris meetings in late October.

Within days of those meetings, the Carter administration learned of an Israeli shipment of arms to Iran, and protested to the government of Israel. After Reagan won the election, however, "substantial" shipments began flowing again. Three sources told Sick that the U.S. government had prepared detailed lists of equipment for Israel to send to Iran. Some were concerned, although unable to prove, that U.S. military stocks from Europe were "laundered" through Israel.

By late 1982, however, the Israeli invasion of Lebanon led to Alexander Haig's resignation as Secretary of State, and his replacement by George Shultz, PhD'49. In a new policy known as Operation Staunch, Shultz "turned off" the Israeli shipments. Within a year, the American Marine barracks in Beirut were truck-bombed and American hostages had been taken in Lebanon. Iran's battlefield performance in its war with Iraq declined at about the same time. Not until late 1984 and early 1985, in the opening moves of what later became the Iran/contras scandal, did the U.S. again begin efforts to send weapons to Iran via Israel.

Tantalizing stuff, indeed. But listen-

ing to Sick's story was also frustrating. Because he was still researching material for a book he is writing on the subject, he wouldn't substantiate his allegations or name his sources, which lent the proceedings an air of rarefied speculation. (Fear of libel suits also played a role in his discretion, he said.) Still, the audience was clearly taken aback. "In three years, I've never heard that long a silence after a presentation," Berger said. While respect for Sick's work kept anyone from frankly stating their disbelief, the audience was clearly skeptical of his story.

In the question period afterward, however, Sick handled tough questions with aplomb. "The Israelis could have aided Iran out of their own interests. Why does the U.S. have to be involved?" asked one participant. Sick explained that certain American equipment was sent to Iran in violation of third-party transfer provisions of the Arms Export Control Act, and that the U.S. government would almost certainly have known about it. Sick gave every indication of wishing he'd never uncovered the things he did. "In the past year, I've changed my mind about this," he said. "I didn't want to believe it."

Why has he gone public, then? Sick explained that the occasion of the tenth anniversary of the hostage crisis brought television reporters who wanted to know his reaction to rumors of the hostage deal, which gained wide currency during the 1988 presidential election. "I told these reporters, yes, I thought there was a deal," he said. "They were pretty surprised." In fact, because Sick's story didn't fit the mold of the hostage retrospective, few reporters actually carried his view in their articles.

Bernard Lewis counted himself among the skeptics. "I just don't see how anything of this magnitude could stay secret for 10 years," he said. "In the current climate, however, anything is possible." In the end, Lewis may still have made the best assessment when he said, "In the Middle East, the only reliable observation is that rational predictions are usually wrong." □

DAVID HAMILTON is a writer at Science magazine in Washington, D.C.

Sloan Fellows

Stuart M. Frey, SM '61, has retired from Ford. He was VP of Corporate Quality & Technical Affairs. . . . **Gerhard Schulmeyer**, SM '74, is now president & CEO of Asea Brown Boveri in Stamford, Conn. He was previously the company's executive VP. . . . **Guy W. Nichols**, SM '61, of Woods Hole Oceanographic Institution, has been honored with election to membership in the American Academy of Arts and Sciences. . . . **Kay R. Whitmore**, SM '75, chair of the board of Eastman Kodak Co., delivered Keuka College's 82nd Commencement address. The college is located in New York State.

The Alumni/ae Association has been notified that **John R. Whitney**, '35, of Pompano Beach, Fla., died on February 1, 1989. There was no further information provided.

Senior Executives

Albert J. Kullas, '73, writes: "I am president of Albert J. Kullas, Inc., offering consulting services in general management, organizational development, systems engineering, and computer applications. I'm active in the MIT Mini-College of Colorado and the MIT Enterprise Forum of Colorado."

The Alumni/ae Association has been notified of the following deaths: **Cyrus Behain**, '72, of San Clemente, Calif., on September 2, 1989; **George Brydon**, '64, of Don Mills, Ontario, Canada, on October 27, 1989; **Paul M. Pitts**, '61, of Sanibel, Fla., on January 20, 1989; and **Nils G. Wahlstrom**, '69, of Lidingo, Sweden, in 1990. There was no further information provided.

Management Of Technology Program

Hank Montrey, SM '82, is the director of the Rocky Mountain Forest and Range Experiment Station for the USDA-Forest Service in Fort Collins, Colo. . . . **Anita M. Kirkpatrick**, SM '85, is a patent agent with Knobbe, Martens, Olsen & Bear in San Diego, Calif. . . . **John E. Krawiec**, SM '85, is a project manager with the Thiokol Corp. at the Marshall Space Flight Center in Alabama. He lives nearby in Madison. . . . **Kunihide Oka**, SM '85, became general manager of the Technology Development Department of Yoshitomi Pharmaceutical Industries, Ltd., in Fukuoka, Japan on April 1, 1990. . . . **Nam-Kuan Teo**, SM '85, was appointed divisional manager of the Technology Transfer Division of Singapore Institute of Standards and Industrial Research in Singapore last April. . . . **Jack Jarkvik**, SM '86, is working as project management consultant with Programator Teknik Stockholm AB in Bromma, Sweden.

John E. Wacholtz, Jr., SM '86, is an internal consultant with Enterprise Financial Group in Arlington, Tex. . . . **George Sonoda**, SM '87, is currently the manager of Electrical Technology at Rolm Systems in Santa Clara, Calif. . . . **Masafusa Atsuta**, SM '88, is an engineer with the Thermal Power Engineering Division of Hitachi, Ltd., in Tokyo. . . . **Donald K. Brown**, SM '88, became RISC System 6000 Manufacturing Engineering manager with IBM Corp. in Austin, Tex., last February. . . . **Rick Amerson**, SM '89, became department manager at Hewlett-Packard Labs in Cupertino, Calif., last May. . . . **Jose A. Cardenas Marroquin**, SM '89, is VP for marketing and technology with Industrial del Alkali, S.A. de C.V. (a Vitro Chemical Sensor) in Monterrey, Mexico. . . . **Minoru Nomura**, SM '89, became director of Technical Administration at Daiippon Ink & Chemicals, Inc., in Tokyo, last April.—Kathy Abourached, Management of Technology Program, MIT Rm. E56-304, Cambridge, MA 02139

XVI AERONAUTICS AND ASTRONAUTICS

J. Wallace McBride, SM '40, sends word: "Am digging my way back from cardiac & cataract surgery. I am still disorganized but expect to be

ready for the next campaign." . . . A note from **Robin Vaughan**, PhD '87, in Montrose, Calif.: "I am a member of the technical staff, navigation section at JPL. I worked on the Voyager Navigation Team during the Neptune encounter. I am now working on Galileo and Pathfinder autonomous landing technology development." . . . **Franklin H. Moss**, PhD '77, has moved to VP of the Consulting Services Group at Lotus Development Corp. in Cambridge. He had been VP of Workstation Application-Systems Technology for Lotus. . . . The University of California at Los Angeles' School of Engineering & Applied Science awarded its 1989 Engineering Citation Award to **Kent Kresa**, '59, president and CEO at Northrop Corp., also in Los Angeles. The University honored Kresa for "his distinguished contribution to the engineering profession."

Sheila Evans Widnall, '61, the Abby Rockefeller Mauze Professor of Aero & Astro at MIT, was awarded an honorary doctor of science degree by Smith College during their 1990 commencement. A Smith press release praises Widnall for "encouraging her students, especially females, to fill the need for scientists in the aerospace research and industry."

Matthew C. Taylor, SM '89, has received an Aviation Safety Award while serving with the 1st Marine Expeditionary Brigade, Marine Corps Air Station, Kaneohe Bay, Hawaii. Taylor received his award for achieving 1,000 accident-free flight hours as a Marine Corps pilot. . . . **Janice Voss**, PhD '87, was accepted last January by NASA to begin astronaut training as a missions specialist for the Space Shuttle Program. She was one of five women in a group that totalled 23, who began training in July.

XVII POLITICAL SCIENCE

Mitchel B. Wallerstein, PhD '78, writes: "I have been appointed deputy executive officer of the National Research Council, which is the principal operating agency of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine."

Navy Captain **Paul R. Brown**, SM '78, has graduated from the Naval War College. During the 10-month course, Brown studied the elements of strategy and policy, defense economics and decision making, and the effective employment of naval forces.

XVIII MATHEMATICS

Robert F. Barnes, Jr., '57, professor of philosophy, has been honored for 25 years of dedicated service at Lehigh University in Bethlehem, Pa. Barnes specializes in logic and sophisticated information systems. He is a former president of the Association for Computational Linguistics. . . . **Ehud Hrushovski**, assistant professor in Course XVIII, has been named a 1990 Sloan Fellow. A grant for \$25,000 will be administered to Hrushovski by MIT over the next two years. Over 500 nominations were submitted and among the committee of distinguished scientists who selected the 1990 Fellows is Course XVIII Professor **Richard B. Melrose**.

Dorothy Weeks, PhD '30, of Newtonville, Mass., died on June 4, 1990. Weeks was a physicist whose career as an educator and researcher spanned nearly six decades. She was the first woman to receive a PhD in mathematics at MIT. On retiring from Wilson College in 1956 after 26 years as a professor and head of the physics department, Weeks joined the Ordnance Materials Research Office of the Watertown (Mass.) Arsenal as coordinator of a project that developed radiological shielding material for use against nuclear weapons, neutrons, and gamma rays. She left the arsenal in 1964 to become a spectroscopist, studying solar satellites at the Harvard

Observatory. She retired in 1976, when she was 83. Meanwhile, she was a lecturer in physics at the Newton College of the Sacred Heart from 1966 to 1971. In addition, Weeks held several different jobs. She was an assistant examiner in the U.S. Patent Office, an assistant in the National Bureau of Standards, an MIT physics lecturer, a supervisor at Jordan Marsh in Boston, and during World War II, she spent two years in Washington with the government's Office of Scientific R&D.

The Alumni/ae Association has been notified that **Walter M. Swarthout**, '49, of Northridge, Calif., died on March 20, 1990. There was no further information provided.

XX APPLIED BIOLOGICAL SCIENCES

Vernon R. Young, professor of nutritional biochemistry at MIT, has been elected a member of the National Academy of Sciences.

XXI HUMANITIES

Kenneth L. Hale, professor of modern language and linguistics at MIT, has been elected a member of the National Academy of Sciences. . . . **Marguerite Browning**, PhD '87, has been approved to be an assistant professor at Princeton University. Browning will teach in the Linguistics Program. Particularly concerned with theory of grammar and syntax, she has taught linguistics at undergraduate and graduate levels. She is currently an assistant professor at the University of Texas at Austin.

XXII NUCLEAR ENGINEERING

Gary J. Dau, SM '87, was honored recently when the Electric Power Research Institute's (EPRI) Nondestructive Evaluation Center in Charlotte, N.C., was named after him. A senior program manager at EPRI, Dau is credited with conceiving the idea of the center and making it a reality. For the last 10 years, he oversaw the center's work to evaluate and improve technology and procedures for power plant component inspection as well as train personnel in their use. . . . **Franklin R. Chang-Diaz**, ScD '77, a member of the technical staff of the Charles Stark Draper Lab, was awarded the University of Connecticut Alumni Association's Distinguished Alumni Award, as well as an honorary doctor of science degree. Chang-Diaz, the first Hispanic-American to travel in space, earned his bachelor's degree at UConn. He was a crew member aboard the 1985 *Columbia* and the 1989 *Atlantis* space shuttle missions.

TPP TECHNOLOGY AND POLICY PROGRAM

Dan E. Jones, SM '81, and family have completed a move from Seoul to Taegu, Korea. Jones is still working for Mitre on a project known as the Korean Intelligence Support System. The project is shifting most of its personnel to Taegu. The Joneses expect to remain there for the next year or so.

Lissa Martinez, SM '80, and Brian Hughes have announced the birth of Neil Eduardo Martinez Hughes. He joined his brother Rico and parents in Takoma Park, Md., on April 10, 1990.

Robert Pearce, SM '90, will join NASA headquarters in Washington to prepare strategic plans for Aeronautical Flight Research in the Office of Aeronautics Technology and Exploration.—Gail P. Hickey for Richard de Neufville, MIT Rm. E40-252, Cambridge, MA 02139.

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William Lee, B.S. '71
Ronald J. Kransdorf
M. Lawrence Oliverio
Ted Naccarella
David A. Tucker
David B. Bernstein
Douglas E. Denninger

Of Counsel

Mark A. Fischer
Peter J. Manus
James J. Foster, B.S. '67
Charles E. Pfund
Philip G. Koenig

Deceased

The following deaths have been reported to the Alumni Association since the *Review* last went to press:

Morell MacKenzie, '11; June 5, 1990; Rehoboth, Mass.

Louis H. Carter, '13; 1968; East Orleans, Mass.

Coke Flannagan, '16; June 15, 1989; Inverness, Fla.

Theodore A. Pierson, Jr., '18; May 7, 1990; Jamesburg, N.J.

Herbert R. Polleys, '18; May 21, 1990; New Haven, Conn.

Henry C. Stephens, '18; August 9, 1988; Honolulu, Hawaii

Alan H. McIntosh, '19; June 17, 1990; York, Penn.

Frederick Bocher, '20; October 31, 1989; Bradenton, Fla.

James E.B. Stuart, '20; April, 1990; Richmond, Va.

Harry Butters, '21; September 1, 1989; Weymouth, Mass.

Thomas H. Derby, '21; May 6, 1990; Andover, Mass.

Eugene A. Hardin, '21; April 1, 1990; Tucson, Ariz.

Robert A. Hill, '21; April 2, 1990; Scottsdale, Ariz.

Herbert B. Loper, '21; August 25, 1989; Satellite Beach, Fla.

Parke D. Appel, '22; June 7, 1990; Venice, Fla.

Roger C. Baumann, '22; June, 1988; Decatur, Ga.

Eleanor Dingee, '22; December 30, 1989; Watertown, Mass.

Joseph J. Forrester, '22; September 28, 1982; Tonawanda, N.Y.

Edwin J. Purcell, '22; September 27, 1989; Oracle, Ariz.

Charles W. Staples, '22; June 27, 1989; Frederick, Md.

Harland C. Forbes, '23; May 15, 1990; Sarasota, Fla.

Robert B. Prinz, '23; September, 1988; Dayton, Ohio

Albert J. Pyle, '23; April 25, 1990; Wilmington, Del.

Hermon F. Safford, '23; October 7, 1988; San Diego, Calif.

Dorothy Weeks, '23; June 4, 1990; Auburndale, Mass.

Christopher M. Conway, '24; April 21, 1990; Pineville, La.

Peter C. Dirksen, '24; October 20, 1989; New Bedford, Mass.

Andrew M. Gault, '24; August 19, 1990; Laredo, Tex.

Allen W. Hawkins, '24; September 20, 1989; West Orange, N.J.

Lynn P. Marsh, '24; November 25, 1987; Nashua, N.H.

J. Lynch Piland, '24; August 27, 1989; San Antonio, Tex.

Samuel Seltzer, '24; April, 1986; St. Louis, Mo.

Joseph A. Tryon, '24; January 9, 1990; Deerfield Beach, Fla.

Ruth H. Westbrook, '24; May 23, 1990; Charlotte, N.C.

Wendell F. Burbank, '25; May 11, 1990; Worcester, Mass.

Harold E. Davis, '25; March 27, 1990; Green Valley, Ariz.

Charles L. Gaines, Jr., '25; March 14, 1988; Birmingham, Ala.

Oscar P. Meaker, '25; February 5, 1990; Mentor, Ohio

Joseph D. Bates, Jr., '26; September 30, 1988; Longmeadow, Mass.

Joseph J. Casey, '26; May 14, 1990; Baytown, Tex.

Thomas M. Hotchkiss, '26; June 5, 1989; Montrovia, Calif.

George A. Makaroff, '26; December 27, 1989; Astoria, N.Y.

Charles E. McCulloch, '26; April 2, 1990; Hightstown, N.J.

Orin Moe, '26; 1989; Pacific Palisades, Calif.

Edmund T. Morris, Jr., '26; April 6, 1990; Roanoke, Va.

Stewart Perry, '26; May 5, 1990; Melrose, Mass.

George A. Pournaras, '26; July, 1989; Baldwin, N.Y.

William H. Stell, Jr., '26; January 11, 1988; Rochester, N.Y.

John A. Sweeton, '26; December 28, 1989; Medford, N.J.

Alan S. Beattie, '27; 1989; Mount Kisco, N.Y.

John J. Dunn, '27; April 9, 1990; Boise, Idaho

Leon M. Ogilvie, '27; June 24, 1990

Albert F. Schaad, '27; April 27, 1990; Bennington, Vt.

Fin D. Sparre, '27; March 20, 1990; Wilmington, Del.

William Beard, '28; February 16, 1989; Fresno, Calif.

Wentworth D. Taber, '28; June 8, 1990; Reading, Mass.

Paul T. Wilson, '28; December 6, 1984; Shawnee Mission, Kans.

Sears L. Hallett, '29; June 21, 1990; Barrington, Ill.

Anthony J. Perry, '29; March 13, 1990; Moneta, Va.

Louise E. Schamps, '29; January 21, 1989; Brooklyn, N.Y.

Richard C. Wood, '29; November 23, 1989; Kennett Square, Pa.

Henry N. Woolman, Jr., '29; April 1, 1990; Pocono Lake Preserve, Pa.

Bartholomeo De Lorenzo, '30; April 6, 1990; Lafayette, Calif.

Louis Harmantas, '30; February 2, 1987; Poughkeepsie, N.Y.

Edwin M. Kingsley, '30; March 28, 1990; Mesa, Ariz.

J.A. Dixon Rapp, '30; March 5, 1990; Glasgow, Ky.

Edward F. Coy, '31; June 2, 1989; Arlington, Va.

Ralphard W. Hartline, '31; May 22, 1990; Sangerville, Maine

F. Arthur Lutz, '31; March 11, 1990; Arlington, Va.

Richard R. Snow, '31; May 10, 1990

Lawrence F. Stauder, '31; February 27, 1990; South Bend, Ind.

James A. Wilson, '31; August 20, 1988; Macon, Ga.

Howard F. Carver, '32; April 2, 1990; Rochester, N.Y.

Gertrude E. Deutsch, '32; 1980; Portland, Ore.

Joseph D. Eisler, '32; March 29, 1990; Santa Maria, Calif.

Jose D. Murga, '32; January 14, 1990; Plateros, Mexico.

Thomas W. Reagan, '32; January 20, 1989; Naples, Fla.

John P. Serrallach, '32; 1987; Barcelona, Spain

George T. Weed, '32; January 6, 1990; Honolulu, Hawaii

Edgar B. Wright, '32; 1985; Harahan, La.

Frederick V. Murphy, Jr., '33; May 8, 1990; East

Falmouth, Mass.

Andrew T. Regan, '33; May 15, 1990; Kingsport, Tenn.

Simeon I. Rosenthal, '33; December 28, 1989; Boynton Beach, Fla.

Stanley H. Walters, '33; November 8, 1989; East Sullivan, N.H.

Vito P. Battista, '34; May 24, 1990; Brooklyn, N.Y.

Julian A. Dorr, '34; March 24, 1990; Punta Gorda, Fla.

Joseph A. Serrallach, '34; December, 1989

John R. Whitney, '35; February 1, 1989; Pompano Beach, Fla.

Sydney R. Karofsky, '37; June 14, 1990; Weston, Mass.

David J. Whitney, '37; May 28, 1989; Bristol, N.H.

William A. Davis, '39; May 26, 1990; Lincoln, Mass.

Donald W. Waterman, '39; October 10, 1989; Easton, Conn.

Walter M. Foster, '40; 1985; Annapolis, Md.

Hrant Isbenjian, '40; May 15, 1990; Stamford, Conn.

Barton L. Weller, '40; May 25, 1990; Easton, Conn.

Charles N. Gilligan, '41; June 4, 1990; Arlington, Mass.

Knut J. Johnsen, '41; June 6, 1990; Newburgh, N.Y.

John E. Demoss, '42; April 19, 1990; Chester, Mass.

Charles R. Stempf, '42; August, 1988; Newport, Australia

John O'Meara, '43; April 26, 1990; St. Louis, Mo.

John Farley, '44; June 2, 1990; Westfield, N.J.

Robert J. Horn, '44; June 8, 1990; Concord, Mass.
Arthur F. Peterson, Jr., '44; January 3, 1989; Star Lake, N.Y.

Robert J. Reilly, '44; April 19, 1990; Riviera Beach, Fla.

John Upton, Jr., '44; May 24, 1990; Pittsburgh, Pa.

Margaret E. Knutzen, '47; 1976; Bronxville, N.Y.

Jerzy C. Kuczynski, '47; May 16, 1990; South Bend, Ind.

Donald Marshall, '48; April 22, 1990; La Jolla, Calif.

Joseph V. Yance, '48; December 7, 1989; Alexandria, Va.

David D. Gaillard, II, '49; June 3, 1990; Washington, D.C.

Stanley A. Murray, '49; April 11, 1990; Kingsport, Tenn.

Syed M.S. Alvi, '50; December, 1987; Woodland Hills, Calif.

Francis L. Fleming, Jr., '50; March 13, 1989; Manhattan Beach, Calif.

Richard S. Pauli, '50; 1987

Fred J. Rayfield, Jr., '50; May 24, 1990; Jericho, Vt.

Federico G. Baptista, '51; March 26, 1981; Caracas, Venezuela.

Jurgen Elkan, '51; May 26, 1990; West Newton, Mass.

Richard R. Fidler, '51; June 13, 1990; Andover, N.H.

Robert J. Greaney, '51; May 17, 1990; Rockville, Md.

J. Arthur Tache, '52; August 30, 1989; St. Clair, Mich.

Sergio F. Valdes, '52; November 24, 1989; Canyon Country, Calif.

Robert N. Noyce, '53; June 3, 1990; Austin, Tex.
G. Lowell O'Daniel, '53; May 19, 1990; Vergennes, Vt.

David W. Dennen, '54; June 21, 1990; Cambridge, Mass.

Russell E. Long, '54; May 22, 1990; Holbrook, Mass.

William F. Stuart, Jr., '55; September 14, 1989; Alpharetta, Ga.

John O. Morin, '56; May 2, 1990; Hingham, Mass.

John D. Crowley, '57; April 21, 1990; New London, Conn.

Donald L. Jarrell, '57; December 3, 1989; McLean, Va.

Don W. Smith, '57; June 10, 1990; New York, N.Y.

William H. Moore, '58; 1989; Princeton, N.J.

James F. Hurley, III, '59; September 15, 1989; Chula Vista, Calif.

David I. Weisblat, '59; April 21, 1990; Galesburg, Mich.

Alfred J. Diefenderfer, '61; November 16, 1989; Fullerton, Calif.

Alan W. Carlson, '62; June 4, 1990; Beverly, Mass.

George Brydon, '64; October 27, 1989; Don Mills, Ontario, Canada

Paul M. Ledoux, Jr., '66; January 18, 1990; Arlington, Mass.

Nils G. Wahlstrom, '69; 1990; Lidingo, Sweden

Cyrus Behain, '72; September 2, 1989; San Clemente, Calif.

Joyce D. Wayne, '75; September 25, 1989; Boston, Mass.

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PUZZLE CORNER

ALLAN J. GOTTLIEB, '67

Cleaning Out the Problem Attic

In reviewing the May/June issue in preparation for the solution section below, I noticed that the following two personal contributions from the readers had inexplicably not appeared. Sorry for the delay. One of Mary Lindenberg's water colors appears in the 1990 American Press Calendar. She has kindly send a copy of the calendar to me; all three pictures, which depict various New England settings, are lovely. Congratulations.

Matthew Fountain writes that a house across the street has been purchased by a young engineer who, with the part time help of his three brothers and seven sisters, improved the foundation, planted trees, and put in a driveway and retaining wall. Knowing the demands put on the parents of just two boys, my hat goes off to the engineer's mother and father.

As we reported in July, "Puzzle Corner" is being phased out due to increased pressure for space in the Alumni section of *Technology Review* and the current issue contains the last installment of this column. As a result there are no new problems this month. I doubt that there are very many people with considerable experience in gracefully terminating a column that has been running continuously for 23 years; certainly I am not one. Let me conclude by thanking my faithful readers whose contributions have been the heart and soul of "Puzzle Corner" for all these years and also thank everyone who has written to me (and to the editors) after hearing that the column is to be discontinued. Thank you all.

Solutions

M/J 1. Doug Van Patter reports that most declarers in the 1989 Cherry Hill Regional failed to make six hearts on the deal shown below. West leads the jack of diamonds (his highest card). Is there a chance of making 12 tricks?



SEND COMMENTS TO ALLAN J. GOTTLIEB, '67, THE COURANT INSTITUTE, NEW YORK UNIVERSITY, 251 MERCER ST., NEW YORK, N.Y. 10012, OR TO: gottlieb@nyu.edu

North	South
♠ A 8	♠ 5 3
♥ Q J 10 4 3	♥ A K 7 5 2
♦ K 10 6	♦ A 7 4
♣ A K 10	♣ Q J 5

The following solution is from Jonathan Hardis: Win the opening lead with the K of diamonds in dummy. Draw trump in 3 rounds, and play an additional round of hearts for a total of four. take the three quick-tricks in clubs, the ace of spades, and then play the low spades. After this point each player has five cards left, and East is marked for the queen of diamonds.

North	South
♠ x	♠ x
♥ 10 6	♥ A 7
♦	♦
♣	♣

If East takes this spade trick, you win. He is out of hearts, a club or spade return allows you to rough and to discard the diamond loser. A diamond return is a free finesse, since he is marked for the queen. If West takes the spade trick, you also win on a club or spade return. However, a diamond return requires some luck. Play the 10. If East lets it ride, you win. If East covers with the queen, take the trick with the ace. The remaining 7 of diamonds may or may not be a winner.

Also solved by Doug McMahon, Nike Agman, Richard Hess, Winslow Hartford, Eric Lund, Steven Feldman, Frederick Furland, Matthew Fountain, John Chandler, Daniel Loeb, Bill Huntington, Eugene Biek, and the proposer.

M/J 2. Randall Whitman proposes the following generalization of 1989 F/M 2. For each positive integer n , consider writing the integers from 1 to n inclusive and let $f(n)$ be the number of times the digit 1 was used. For what values of n does $f(n) = n$?

John Chandler found them all and writes: Obviously, the first is $n = 1$. After that, they get scarce, and the next is $n = 199,981$. To see that, it is useful to count the 1's in each column separately, so that we can make use of the "clumping." For example, all the ten's digit 1's from 1-100 lie in 10-19, and there are exactly 10 of them. Thus, we see that $f(9) = 1$, $f(99) = 10 \times f(9) + 10 = 20$, $f(999) = 10 \times f(99) + 100 = 300$, and so on. It is easy to see that the ratio $f(n)/n$ reaches a local minimum each time n reaches $10^x - 1$ (or $10^x - 1$ modulo 10^{x+1}) and then grows faster than average until n reaches $2 \times 10^x - 1$ (or modulo). From the values shown above, it is clear that the minimum is $x/10$ (plus a little) and that there will be no solutions for $n > 10^{10}$. Also, the local maximum at $2 \times 10^x - 1$ is $(5 + x)/10$ plus a little, so the first solution after $n = 1$ must be about 2×10^5 . We get $f(199,999) = 200,000$, so we must back off past the last number ending in "1" to get $f(n) = n$ and then back off again to get numbers with $f(n) < n$. Thus, all numbers from 199,981 through 199,990 are solutions, as well as 200,000 and 200,001. From there to 300,000, it is clear that $f(n) = 200,000 + f(n-200,000)$, and so on up to 10^6 , at which point, the ratio climbs again from the low of 0.6. Since $f(999,999) = 600,000$, and gains by 50,000 per 100,000, we find that $f(1,599,999) = 1,600,000$, and we pick up ten more solutions: 1,599,981 through 1,599,990. The ratio then continues to climb until $n = 1,999,999$

and then falls back so that $f(2,599,999) = 2,600,000$, and we pick up two more: 2,600,000 and 2,600,001. Similarly, the ratio hits another minimum at 10^7 and climbs up again to give a solution of 13,199,998. On the subsequent descent, we cross the break-even point at 35,000,000 and then repeat the initial pattern: 35,000,001, 35,199,981 through 35,199,990, 35,200,000, and 35,200,001. The next ascent gives 117,463,825. There's another break-even at 500,000,000, which repeats the initial pattern again: 500,000,001, 500,199,981 through 500,199,990, 500,200,000, 500,200,001, 501,599,981 through 501,599,990, 502,600,000, 502,600,001, 513,199,998, 535,000,000, 535,000,001, 535,199,981 through 535,199,990, 535,200,000, and 535,200,001. The next ascent gives a solution of 1,111,111,110—and that's the last one, since the following ascent reaches the minimum at 10^{10} without hitting a solution.

Also solved by Jonathan Hardis, Keith Price, Richard Hess, Daniel Loeb, Winslow Hartford, Ken Rosato, Jim McNamara, Matthew Fountain, Bill Huntington, Steven Feldman, Michael Baumann, Harry Zaremba, Bob High, Nob Yoshigahara (who has a different generalization), and the proposer.

M/J 3. Richard Hess has a drinking problem he wants us to help him solve. Consider three containers that hold 15 pints, 10 pints, and 6 pints. The 15-pint container is full and the other two are empty (15,0,0). Through transferring liquid among the containers you are to measure out exactly 2 pints to drink, drink the 2 pints, and continue transferring liquid to end up with 8 pints in the 10-pint container and 5 pints in the 6-pint container (0,8,5).

David Webster sends his answer, adding "We had fun solving this one, using beer as the liquid!"

15 pt	10 pt	6 pt	
15	0	0	
9	0	6	
9	6	0	
3	6	6	
3	10	2	drink
3	10	0	
3	4	6	
7	0	6	
7	6	0	
1	6	6	
1	10	2	
11	0	2	
11	2	0	
5	2	6	
5	8	0	
0	8	5	

Also solved by Doug McMahon, Keith Price, James Walker, Robert Moeser, George Wood, Thomas Black, Walter Cluett, Mary Lindenberg, Robert Bart, Richard Hess, Steven Feldman, Ken Rosato, Jim McNamara, Joel Shwimer, Dave Pinckney, Peter Tzanetos, Richard Kruger, Rong Ho, Ermanno Signorelli, Matthew Fountain, John Chandler, Daniel Loeb, Bill Huntington, Eugene Biek, Michael Baumann, Roy Sinclair, Angel Silva, Harry Zaremba, Robin Pitcher, Thomas Jabine, David Gluss, Richard Boyd, Bob High, Marlon Weiss, Jeffrey Harris, and the proposer.

M/J 4. Gordon Rice wants you to extend the following sequence of Pythagorean triangles at least four more steps.

3	4	5
20	21	29
119	120	169
696	697	985
4059	4060	5741
23660	23661	33461

I guess it is fitting that the very last problem gave rise to a large number of exceptionally fine solutions. There were several fine analytic solutions that space considerations preclude printing (but I will send copies if requested) as well as heuristics and extensive computer searches. The following solution, from David Harris (an entering freshman), has a little of each:

Let the three legs be a , $a + 1$, and $a + n$. Then, you can solve for $a + n$:

$$(a)^2 + (a + 1)^2 = (a + n)^2$$

$$n^2 + 2an - (a + 1)^2 = 0$$

$$n = \frac{-2a \pm \sqrt{4a^2 + 4(a + 1)^2}}{2}; n \text{ is chosen to be}$$

greater than zero. Therefore:

$$n = \sqrt{2a^2 + 2a + 1} - a, \text{ or}$$

$$a + n = \sqrt{2a^2 + 2a + 1}$$

Thus if $a + n$ is an integer, the three lengths form a Pythagorean triplet. Next, I noted that after the first few terms the ratios between successive "a" values monotonically approached an asymptote near 5.82 from above. I wrote a program that uses the ratio between the prior two a's to guess the next term. The algorithm is extremely efficient: it can calculate new terms faster than it can write them to the screen on a Mac II. Below are listed the first 24 triplets. After 24 triplets, my 80-bit floating point numbers were not sufficiently precise.

Also solved by Keith Price, Mary Lindenberg, Robert Bart, Robert Oliver, George Ropes, Mark Lively, Scott Maley, James Wilcox, Richard Hess, Winslow Hartford, Eric Lund, Steven Feldman, Frederick W. Furland, Gerald Leibowitz, N. F. Tsang, John Granlund, Frank Carbin, Charles Piper, Jim Landau, David Waggar, Matthew Fountain, John Chandler, Bill Huntington, Roy Sinclair, Mary Lindenberg, Avi Ornstein, Angel Silva, Walter Nissen, Harry Zaremba, Robin Pitcher, David Gluss, Richard Boyd, Jim Landau, Bob High, and the proposer.

Triplet #1: 3 4 5
 Triplet #2: 20 21 29
 Triplet #3: 119 120 169
 Triplet #4: 696 697 985
 Triplet #5: 4059 4060 5741
 Triplet #6: 23660 23661 33461
 Triplet #7: 137903 137904 195025
 Triplet #8: 803760 803761 1136689
 Triplet #9: 4684659 4684660 6625109
 Triplet #10: 27304196 27304197 38613965
 Triplet #11: 159140519 159140520 225058681
 Triplet #12: 927538920 927538921 1311738121
 Triplet #13: 5406093003 5406093004 7645370045
 Triplet #14: 31509019100 31509019101 44560482149
 Triplet #15: 183648021599 183648021600 259717522849
 Triplet #16: 1070379110496 1070379110497 1513744654945
 Triplet #17: 6238626641379 6238626641380 8822750406821
 Triplet #18: 36361380737780 36361380737781 51422757785981
 Triplet #19: 211929657785303 211929657785304 299713796309065
 Triplet #20: 1235216565974040 1235216565974041 1746860020068409
 Triplet #21: 7199369738058939 7199369738058940 10181446324101389
 Triplet #22: 41961001862379596 41961001862379597 59341817924539925
 Triplet #23: 244566641436218639 244566641436218640 345869461223138161
 Triplet #24: 1425438846754932240 1425438846754932241 2015874949414289041

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Better Late Than Never

A/S 2. Victor Christensen believes that "all diagonals" in a square means only the main and anti-diagonal. The better late than never remark given in May/June included diagonals that "wrap around" the square. For example in a 3 by 3 square one such diagonal would be [(1,2),(2,3),(3,1)].

APR 2. Jim Landau and Robert Bart have responded.

APR 3. David Gluss and Robert Bart have responded.

APR 4. David Waggar and Robert Bart have responded.

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CAREER: After graduating from MIT in 1939, Mr. Pope served as assistant chief engineer in an industrial plant in Argentina, as a British Royal Engineers officer, and as a U.S. troop commander during World War II. He settled in Puerto Rico and formed F.F. Industries Corporation, which manufactured tools, dies, special machinery, and metal and plastic fabricated parts. He sold the company and retired in 1981.

In 1983, in memory of his first wife Nancy, he and his two sons

helped finance the restoration of a century-old New Hampshire covered bridge. This action helped bring him together with the present Mrs. Pope, an Englishwoman he had met in Buenos Aires and had last seen when he left England to join the U.S. Army 1st Division's invasion of North Africa. In 1984, while watching a newsreel of the Normandy landings, she remembered her wartime friend. Recalling that he spoke often of New Hampshire, she called information in Concord. The operator there

happened to recognize the name of the man who had restored the bridge and so was able to help her. Mr. and Mrs. Pope were married in 1986.

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QUOTE: I went to MIT because I wanted to show up my father, who didn't think I could make it. MIT got me on the right road and made me realize what I was capable of doing.

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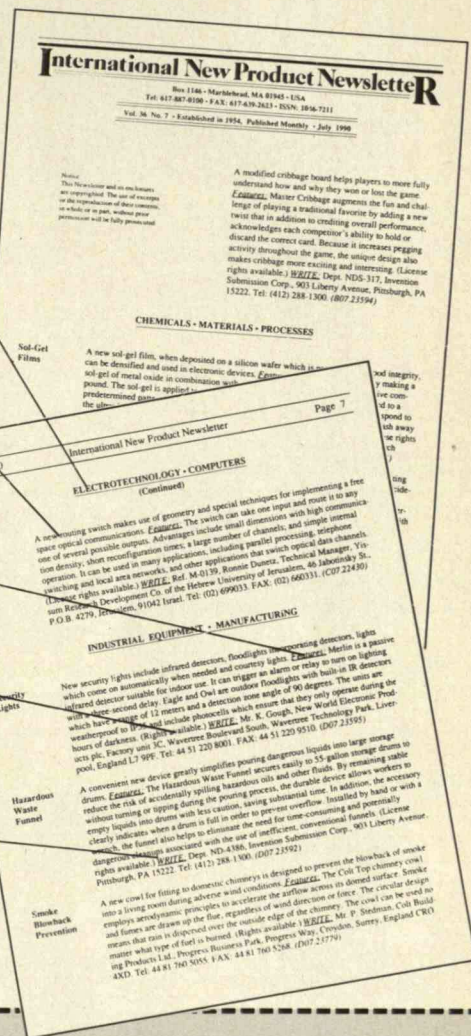
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*Environmentalists are infiltrating government,
winning legal victories, and battling Amazon deforestation
with a vigor that may surprise outsiders.*



Brazil's Thriving Environmental Movement

By NIRA BRONER WORCMAN

THE impression has been widespread in developed nations that while the world fights to preserve Brazil's natural environment, Brazil simply doesn't want to be preserved. Granted, there is good reason for international concern about the South American environment. The burning of the Amazonian rainforest, which represents 30 percent of the world's tropical forest, contributes to the risk of global warming by releasing vast amounts of carbon dioxide. It also endangers numerous animal and plant species that are important to medicine, biotechnology, and agriculture. It has been estimated that the rainforests house 40 to 50 percent of the species on earth, some of them valuable sources of pharmaceuticals for glaucoma, cancer, and perhaps even AIDS.

Despite the impressions of outsiders, however, Brazilian ecologists started their own fight to preserve the rainforests two decades ago. In the mid-1970s ecologist and agronomist Jose Lutzenberger, now the Brazilian environmental secretary, started the first protests against World Bank financing of gigantic mining, hydroelectric, and agricultural projects in the Amazon. "When we noticed that a significant part of the forest devastation was caused by multinational companies and financed by the multilateral development banks with money from the First World taxpayers, we realized that it was necessary to make them aware of the problem," Lutzenberger says. "If today



"They are taking the green out of our land," reads one environmental group's banner, modeled on the Brazilian flag.



Left: Although the Amazon rainforest still covers a vast area in northwestern Brazil, the endangered Atlantic rainforest has dwindled to 5 percent of its original size.

Opposite: President Collor recently appointed ecologist Jose Lutzenberger (left) as Brazil's new secretary of the environment. Fabio Feldmann (right) sponsored the environmental section of the country's 1988 constitution. Bottom: Environmental awareness has become the country's newest fashion statement.

the First World governments, Margaret Thatcher, Francois Mitterrand, Helmut Kohl, and even George Bush show their concern with the destruction of the Brazilian rainforest, it is because the environmentalists from those countries reacted to the information we sent them."

An important victory came in 1987, when environmentalist Chico Mendes, head of a group of indigenous rubber tappers, persuaded the Inter-American Development Bank (IDB) to suspend a \$150 million loan for paying highway BR-364 through the southwestern Amazon. The IDB and other development agencies also began in the late 1980s to demand assessments of environmental impact more consistently before loaning money to projects in Brazil. These actions play an important role in measures adopted by the Brazilian government itself. The Our Nature Program, launched two years ago to halt deforestation in the Amazon, and IBAMA, the new Brazilian Institute of the Environment and Renewable Natural Resources, were both products of such international pressure, according to former IBAMA president Fernando Cesar Mesquita.

Still, there are also strong forces pulling in the other direction. Mendes himself was slain in 1988 for his efforts to slow the clearing of the rainforest, and the funds to complete highway BR-364 could still come from

other sources. The Japanese, for instance, have shown an interest in funding the extension of highway BR-364 to Peru, allowing Pacific access to valuable Amazonian timber. Mesquita says the road must be constructed for its economic, political, and strategic importance to Brazil as the country's only connection with the Pacific Ocean. "We can build this road without damaging the environment, constructing it as a corridor passing through national reserves," he says.

But this is not what Lutzenberger has in mind. He accepted the new post of environmental secretary after President Fernando Collor de Melo agreed to halt plans for the highway. Collor also agreed to respect the rights of the indigenous people of the forest and to cut all economic incentives to destructive projects in the Amazon.

Choosing Lutzenberger as environmental secretary might be a sign that the Brazilian government is getting serious about preserving its environment, even if that means going against powerful economic interests. "We will have to face strong pressure from several economic groups that are interested in keeping the devastation going," Lutzenberger said in a visit to Washington last April.

Lutzenberger's appointment was at the very least a smart political move. A prominent ecologist in Brazil, Lutzenberger has won recognition worldwide for his work to preserve the environment, including his battle

NIRA BRONER WORCMAN is a free-lance journalist from Brazil specializing in high technology and environmental issues. In 1988-89 she was a Knight Science Journalism Fellow at MIT.



against pesticide use. In 1988 the Swedish government bestowed on him the Right Livelihood Award, considered the Nobel Prize for environmentalism.

For many environmentalists, however, it is odd to see Lutzenberger in a governmental position, since he has always assumed an opposing posture, calling the previous administration *desgoverno*, meaning non-government. Some are skeptical about his knowledge of the issues and his ability to implement environmental policy in Brazil, but they are reluctant to speak out, since he is part of their movement. They are doubtful about how much leeway he will have to reform old policies, and they believe that he will not remain in the government for very long.

President Collor has said that he considers the environmental question a priority on the national agenda. If Brazil does not face its environmental problems, he says, it will have trouble getting the external loans to implement new economic development projects. The money for environmental programs, at least, is easy to borrow. A \$117 million World Bank loan will pay three-quarters of the cost of environmental protection programs in Brazil over the next three years.

How Brazil's Environmental Movement Emerged

The environment has long been a political issue in Brazil, serving for more than a decade as one of the only

channels open for civilian activism. From 1964 to 1984 Brazil was ruled by a military dictatorship, which, like many regimes struggling to industrialize, dismissed ecological concerns. It focused instead on economic development at any cost, usually at the expense of the environment.

In 1972, during the first United Nations Environmental Conference in Stockholm, Brazilian Minister of the Interior Costa Cavalcanti made a remark that epitomized this attitude. He stated that Brazil would not change its economic policy, based on growing as quickly as possible. Gigantic and costly construction projects, including hydroelectric plants and roads, were the centerpieces of that model. Large loans from multilateral development agencies like the World Bank, whose policy was founded on the idea that high standards of living follow from industrialization, supported such an approach.

During the 1972 conference, Cavalcanti said that "a country that has not yet achieved a minimal standard of living is not in a position to spend its valuable resources protecting the environment." He asserted that the worst form of pollution is human poverty, and said he would risk environmental degradation if that were the result of an economic policy that would improve Brazilians' quality of life.

Back home, the pronouncement generated vigorous opposition. "It brought together anarchists, communists, and conservatives," proving that the environmental movement did not belong to only one party or ideology, says veteran environmental journalist Randa Marques from the São Paulo daily newspaper *Jornal da Tarde*. In the view of these new activists—middle-class intellectuals, artists, architects, scientists—development at any price destroyed the environment and brought human poverty.

In fact, although Brazil did grow rapidly—an average of 7 percent per year during the 1970s—the distribution of wealth is still grossly unequal. A recent World Bank report shows that the richest 20 percent of Brazil's citizens receive 61 percent of the gross household income, while the poorest 20 percent receive only 4 percent. Most Brazilians cannot feed themselves adequately.

Just as Brazil's rapid growth has left many of its people behind, it has contributed to some of the country's most serious environmental problems. Large construction projects wreaked havoc in the rainforest as they added to Brazil's huge foreign debt. The Balbina dam project in the state of Amazonas, for example, flooded 900 square miles of rainforest, while the Tucuruí dam project, in the state of Pará, flooded about 940 square miles. The colonization project called Polonoroeste, involving the construction of the highway Mendes fought, was the main cause of the devastation in Rondonia state, one of the most deforested areas in the Amazon.

In response to government negligence toward the environment, activists organized the Brazilian environ-



Massive hydroelectric projects like the Tucuruí dam (above) have flooded thousands of square miles of rain-forest (below).



mental movement. Lutzenberger founded the first ecological organization in Brazil, the Association for the Protection of the Natural Environment of Rio Grande do Sul (AGAPAN), in 1971. (The Brazilian Federation for Nature Conservancy, FBCN, was founded in 1958, but until the 1980s it had a strictly conservationist, not political, character.) AGAPAN extended its scope beyond the southern state of Rio Grande do Sul, organizing political actions like protests against nuclear power and nuclear weapons. The environmental movement was able to survive during these early years largely because the repressive military regime did not consider it strong enough to be a threat.

Environmentalists gave speeches and held demonstrations. Some tried especially to heighten public awareness of ecological problems. The artist Miguel Abellá, for instance, attracted heavy press coverage in 1973 by walking out into the streets of São Paulo, Brazil's largest industrialized city, wearing an oxygen mask to dramatize the dangers of air pollution. Other protests were directed toward preserving historical monuments or specific areas, such as the Caucaia do Alto ecological reserve in the state of São Paulo, where developers planned to build an airport in 1978. The effort to block this project gained support from the country's only existing opposition party, the Brazilian Democratic Movement, as well as from the major newspapers and professional unions. The airport was never constructed.

The Official Response

Brazilian participation in the 1972 U.N. conference inspired at least a small official gesture toward environmentalism. In 1974 the government created SEMA—the Brazilian National Environment Agency—and appointed ecologist Paulo Nogueira Neto to head it.

In Nogueira Neto's opinion, the conference marked the emergence of environmental concern not only in Brazil but worldwide. Yet SEMA, a part of the Ministry of the Interior, was given virtually no resources to address that concern. "We had three employees and only two rooms to work in," says Nogueira Neto. He held the position for 12 years until 1986, working first with the military and then with the civilian government that succeeded it.

Environmentalists in Brazil say that Nogueira Neto's long coexistence with different regimes was possible only because SEMA was a puppet agency, intended to mask the government's inactivity on environmental problems. "SEMA did no good," says ecologist Azis Ab'Saber. "Nobody looked after the environment."

SEMA did not have the same political support that IBAMA has today for implementing environmental policy, but Nogueira Neto disagrees that it was a puppet. "I could keep my position in both regimes because I had a technical function, without any political or ideological guidance," he says. He was responsible for creat-

ing the Ecological Station Program, a project aimed at maintaining Brazil's extensive biological diversity. Twenty-one ecological stations have been established, monitoring a total area of some 7 million acres. At least 90 percent of the natural areas surrounding the ecological stations is to be left undisturbed, and up to 10 percent is to be dedicated to research on burning and other forms of human interference in natural systems.

The Anavilhana station, for instance, created in 1981 near the city of Manaus in Amazonas, covers 865,000 acres of seasonally flooded lowland forest, encompassing hundreds of river islands, many lakes, part of the Amazon rainforest, and marshy forests with many palms. At this station Michael Gouding, a researcher from the National Institute for Research in the Amazon, discovered that a species of fish called Tambaqui feeds itself with the fruits of trees when the area is flooded, spreading the seeds and aiding the trees' reproductive process in the same way that birds do. In Raso de Catarina, in the northeast state of Bahia, National Museum researcher Helmut Sick discovered a species of parrot that had been considered extinct for 50 years. Now this species is being protected.

Unfortunately, the stations and the research carried on there were practically abandoned in 1984, when SEMA became part of the Ministry of Habitation and the space for environmental issues on the Sarney administration's agenda began to shrink, culminating in Nogueira Neto's resignation in 1986.

Brazil's national forests and parks, including the ecological stations and other types of conservation areas, cover only 2.5 percent of the territory that, by law, ought to be preserved. Several reserves exist only on paper. "Those areas are nobody's land, where everything can happen, from fire, hunting, timber, and mineral exploitation, to roads and dam construction," says Maria Tereza Jorge Padua, president of the environmental organization Pró-Natureza Foundation, which is working to preserve several conservation areas in Brazil.

Changes Under Democratic Rule

Brazil's transition to democracy in the early 1980s brought environmentalism to the fore, providing new leaders and important new laws to address environmental problems. In 1982 the first popular elections for state governments took place, in a process of democratization started by the military rulers in 1979. Several state governments recruited environmentalists to serve in appointed offices. In some cases, as in São Paulo and Mato Grosso do Sul, the heads of the environmental agencies came directly from the environmental movement. Since then, not only has Lutzenberger been appointed to the nation's highest environmental post, but environmentalists have also become state deputies and members of congress.

Environmentalist Fabio Feldmann is president of OIKOS, the Union for the Defense of the Earth. Tak-



Burning the rainforest (below) releases vast amounts of carbon dioxide into the atmosphere, adding to the risk of global warming. In the city of São Paulo (above), these canoeists wear masks to dramatize the dangers of air pollution.



ing advantage of a 1985 law giving citizens the right to sue anyone damaging the environment, Feldmann's group is suing the entire industrial complex in the polluted city of Cubatao in São Paulo State. In 1986 Feldmann became the first deputy to the Brazilian Congress to be elected on an exclusively environmentalist platform. His election surprised even himself. "We launched our campaign intending to draw attention to environmental problems," he says. "We didn't think we were going to win. There were so few of us that we all fit into a microbus with three seats left over."

The environmental chapter of the new Brazilian constitution, sponsored by Feldmann, will have an impact that lasts long after his term in office. It ensures the right to a balanced environment and imposes on the government and the community the duty to defend and preserve that balance. Under this chapter the government must also foster ecological education at all levels and promote public awareness of the need to preserve the environment.

The constitution declares that the Amazon forest, the Atlantic forest, and the coastal zone are national treasures, assigning responsibility to preserve them to the federal government. It imposes on the government the responsibility of maintaining essential ecological processes and ecosystems and the various species they host, as well as controlling the production and use of substances that may threaten public health and the environment. The new constitution also defines "ecological crime," providing penal sanctions against people and institutions who damage the environment.

Powerful lobbies, including the chemical, nuclear, and mining industries, opposed Feldmann in the fight for the environmental chapter. "Several times during the voting sessions, we had clauses that were mysteriously taken out of the article," he says. But he gained an important ally in the dispute: the Green Front, which united more than 80 members of congress from different parties determined to support the environmental cause in the constitutional assembly.

Constitutional protection for the environment represents a significant advance, but it alone cannot change Brazil. "It seems a paradox that we have such an advanced constitution and such a horrible reality," says Feldmann, who points out that much work remains to be done through ordinary legislation. He is also afraid that the laws will not be obeyed. "We have a tradition in Brazil of not respecting legislation," he says. "The applicability of the constitution will depend on the pressure that the civilian society places on the government."

The Our Nature Program, announced by Sarney when the new constitution was ratified, was intended to bolster enforcement efforts in the Amazon. Among other measures, the program includes an emergency plan to preserve the rainforests through the inspection and control of deforestation. It withdraws fiscal incentives for farming and cattle raising in the forests, strictly

regulates the use and production of pesticides in Brazil, and creates a commission to coordinate research on the Amazon as well as a fund to channel donations into environmental projects. Under Our Nature, the rate of deforestation in the Amazon decreased 30 percent in 1989 as compared to 1988, according to Mesquita. (However, satellite data from INPE, the Brazilian Institute for Space Research, show that the rate of deforestation between January 1989 and July 1990 equaled the average rate of deforestation during the 1980s, about 9,250 square miles a year.)

The establishment of IBAMA in February 1989 was also part of Our Nature. IBAMA integrated the functions of the old agency SEMA with the duties of the fishery, rubber, and forestry development institutions in Brazil. To Feldmann, the creation of IBAMA represented "the acceptance of the idea that the management of natural resources is connected to the country's economic activities."

Like SEMA before it, IBAMA has a very small budget, but what the agency lacks in monetary support it makes up for in political resolve. Mesquita, the agency's first head, points out that IBAMA has helped ensure that previously unenforced environmental legislation will be followed. A 1965 code requiring logging companies to replant enough trees to match consumption, for instance, was virtually ignored until recently. "It became part of Our Nature, and with political will, we enforced it," Mesquita says.

But some laws are more difficult to implement, even with political will. "We tried to put some farmers who were illegally burning the forest in prison, using the constitutional clause of ecological crime, but the state police ordered us to free them," Mesquita relates. The institute has only 600 employees and five helicopters to patrol the entire Amazon area, which covers 57 percent of Brazilian territory. To make matters worse, fines imposed for unauthorized burning in the Amazon have brought death threats to some officials. Two IBAMA rangers, Eduardo Rosa Alves and Hipolito Vilmar Lopes Garcia, were murdered in 1989. Neither case has yet been solved.

Mesquita himself escaped an assassination attempt last year; a bullet whizzed by his head as he jogged in the capital city of Brasilia. Also last year, large landowners declared on television that they would destroy the helicopters used by IBAMA to control deforestation. Mesquita, in turn, appeared on TV to respond to the threats, saying that the federal police would retaliate with machine guns.

The fact is that in Brazil many landowners hire their own gunmen, make their own justice, and are unintimidated even by the police. Last October federal police officer Joao Geraldo Dias was shot twice while accompanying IBAMA inspectors on a routine operation in the state of Maranhao. And this case is not an isolated one. Since 1980 more than 1,000 peasant smallholders have been killed over land disputes in rural areas, and



Left: In a country where the richest 20 percent of the population receives 61 percent of the income, poverty and homelessness are rampant. Above: More than 1,000 small landholders have died in violence over rural land disputes since 1980.

the police have failed to solve all but a few of the cases, according to Amnesty International.

Improved enforcement alone might not solve the problems in the Amazon if the deeper causes of violence are not addressed. "Making use of repressive mechanisms is not going to solve the environmental and social problems," says Feldmann. Mesquita agrees, saying that "we can't change the situation in the Amazon without an agrarian reform." Brazil has one of the most concentrated land-use structures in the world. According to 1984 data from Amnesty International, small farms of 250 acres or less account for half the total number of rural properties but cover only 3 percent of the occupied land. Estates of over 2,500 acres, which make up less than 1 percent of the number of rural properties, occupy 43 percent of the land.

Packaging the Environment

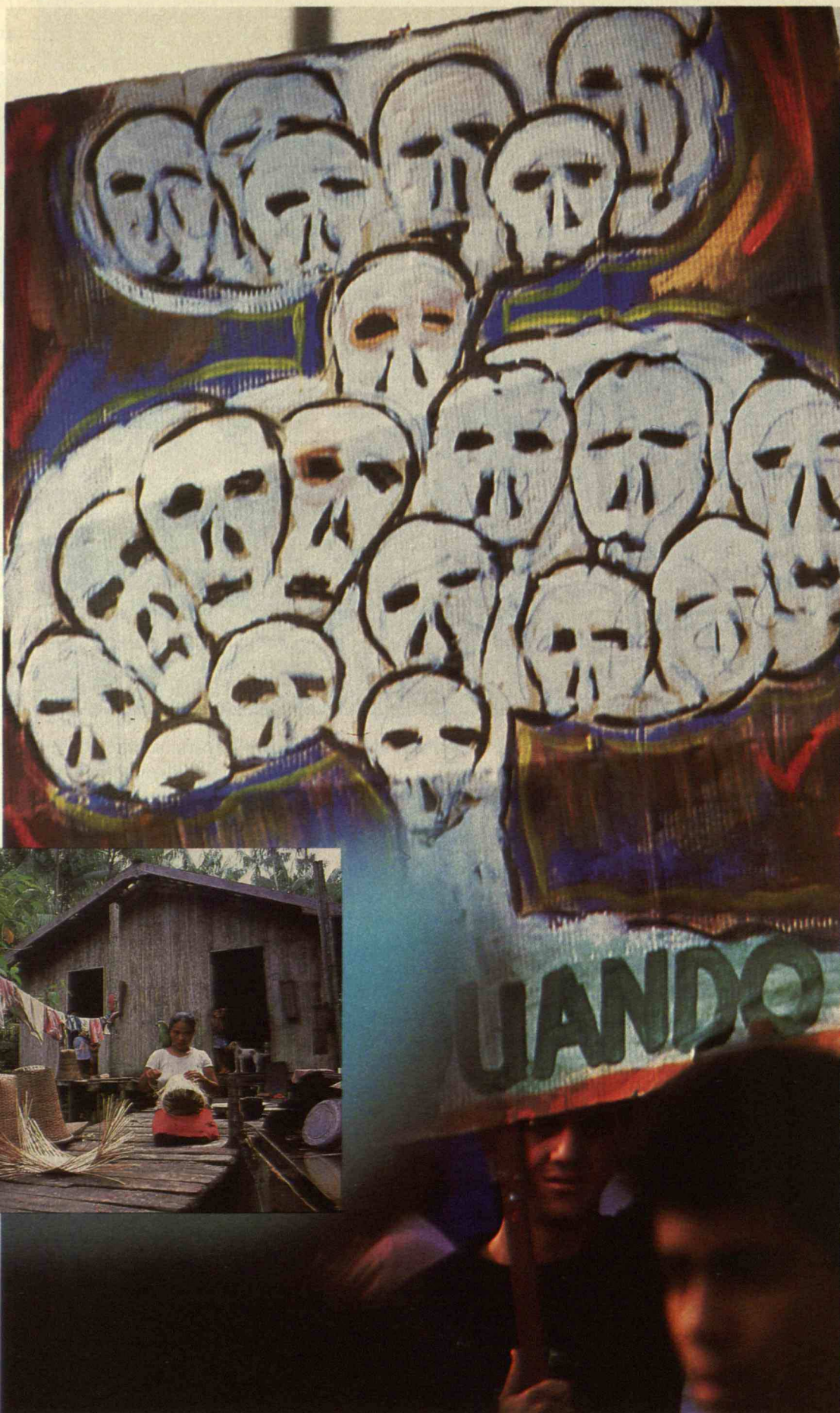
Environmentalism has become a popular cause in Brazil. A 1989 poll by the advertising firm Standard, Ogilvy & Mather showed that interest in deforestation among Brazilians was second only to concerns about salaries. Consumer prices, the federal budget, and state intervention in the economy were of lesser interest. Entrepreneurs have capitalized on this concern to market a wide array of new products. Fashion advertisements feature environmentalists such as Fabio Feldmann as

models. T-shirts with environmental motifs sell well, and travel agents and environmental organizations are promoting "ecotour" theme travel packages. Large corporations produce luxurious ecology books for their best clients as the traditional New Year's gift.

The number of television programs, news reports, and ads concerning the environment is multiplying. The radio station at the University of São Paulo, for instance, airs a weekly 50-minute program called "Nova Terra" (New Earth) dedicated exclusively to ecology. The Brazilian TV network Manchete took first place in the ratings after the premiere this March of the environmentally oriented soap opera "Pantanal," named after the vast freshwater wetland system in the center of Brazil where the soap's action is located.

To a considerable extent, however, environmentalism in Brazil is a fad. A 1989 poll by a major newspaper, *Folha de São Paulo*, showed that although the population of São Paulo is concerned with preserving the environment, this concern has not been translated into action. The majority of the people still throw litter in the streets and take no measures to improve the quality of life in the city. "Brazilians have a notion about environmental problems," says Feldmann, "but they are not aware of the role they can play to change the situation. Neither are they directed or organized enough to support the environmental cause in a consistent manner."

Right: During two decades of military dictatorship, environmentalism was one of the few forms of civilian activism tolerated by the government. Now Brazil contains some 1,000 environmental organizations, most focusing on local problems. This 1987 protest was against the disposal of radioactive waste in Goiânia in Goiás state. Below: Environmentalists point to the traditional ways of life of the indigenous people of the Amazon as a sustainable alternative to mining and deforestation.



Nevertheless, Brazil now harbors some 1,000 environmental organizations, most of them concerned with local projects. S.O.S. Mata Atlantica, for instance, was founded in 1986 by a group of ecologists to save the remaining 5 percent of the Atlantic rainforest on Brazil's east coast. The group sponsors environmental education programs for teachers, instructs fishers on how to harvest oysters without depleting their supply, and reaches millions of Brazilians through the media with its campaign against deforestation.

Indigenous Efforts to Save the Amazon

Native people from the Amazon rainforest, like the Indians and the rubber tappers, are also organizing themselves to protect the area where they live. For these groups, preserving the natural environment is a struggle for survival, since the forest is their home and the source of their livelihood.

Indians have suffered the most from environmental damage to the rainforests. Their population, estimated at 1-5 million in the year 1500, has been reduced to about 220,000. The new constitution recognizes the Indians' right to preserve their culture and the land they have traditionally occupied or used in productive activities, but strong economic interests still push the Indians out of their homeland. For example, 50,000 gold miners invaded the mineral-rich Yanomami Indian territory in the northern Amazon last year, devastating much of the Yanomami land and bringing disease and death to the tribe. After a judicial order evacuated the miners, former president Sarney signed a decree opening 5 percent of the Indian territory to them. President Collor later reversed Sarney's decision and started an operation to destroy the 110 airstrips that were the miners' only access to the area. However, this operation was not effective. Federal attorneys who visited the area said in July that the exploded airstrips had already been reconstructed and that new ones were being built. The Yanomami Indians, they said, were in their terminal stage, decimated by malaria and other illnesses brought by the miners.

"For 400 years we have fled, but now we don't have anywhere to go," says Ailton Krenac, coordinator of the Union of Indigenous Nations of Brazil (UNI). "When almost the whole world is worried about the preservation of the rainforest, I believe that our community, which has always lived in harmony with nature, has a big contribution to make." UNI is working to identify sustainable economic activities that would enable Indian communities to participate directly in the economy without destroying the environment and their traditional way of life. Last year, UNI created the Indian Research Center for Resource Management in Goiás state in the center of Brazil. There, Indians are being trained in such skills as identifying local fruits that can become marketable crops.

Rubber tappers, who banded together in the Nation-

al Council of Rubber Tappers in 1985, have also lost much from the deforestation of the Amazon, including their former leader Chico Mendes. With the help of the Institute for Amazonian Studies, an environmental organization in Paraná state, the council has created and won governmental approval for the concept of extractive reserves. Such areas are set aside for extracting and processing rubber as well as for collecting nuts and fruits. Extractive reserves are a sustainable development alternative for the Amazon, since they do not cause deforestation. Several studies have shown that extractive activities can be more profitable than cattle raising or logging in the rainforest. Since January, 9.4 million acres have been set aside as extractive reserves.

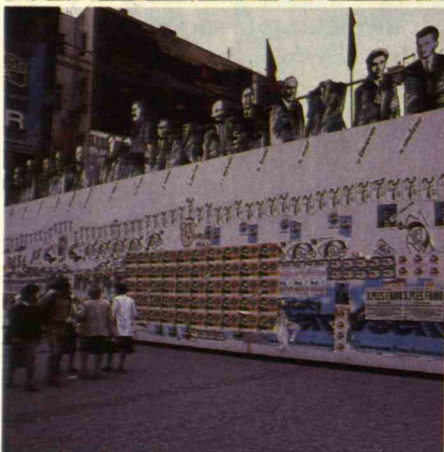
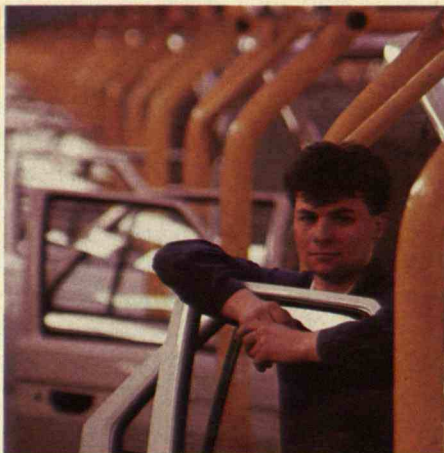
Old Problems, New Thinking

Despite some victories, the struggle in Brazil continues. The Amazon is still burning, destructive projects are still carried on, and environmentalists, Indians, and rubber tappers alike must still fight for the rights guaranteed to them by law.

Some Brazilians think the environmental movement is largely ineffective. Economist Henrique Rattner, from the University of São Paulo, believes the movement sidesteps the political and economic factors that are the real cause of environmental abuse. The majority of environmental problems, he says, stem from the capitalist model of development, aimed at maximizing corporate profits and transferring the costs to society. The developed countries also have environmental problems, he points out, but since their societies are more mature and organized, they can take more efficient action to protect the environment.

Feldmann believes the environmental movement in Brazil has to adopt a less conservationist vision and start studying new systems of development. These should be based on democratized decision making, appropriate technologies, a more equal distribution of wealth, and a stronger domestic market to attend to the population's basic needs. Secretary of the Environment Lutzenberger says it is necessary to rethink the basic ideology of industrial society, which conceives of the earth only as a resource to keep society growing. The earth is a living organism, Lutzenberger asserts, and if humanity doesn't learn to live in harmony with nature, we will die along with it.

In response to the Brazilian government's invitation, the second United Nations Environmental Conference will take place in Brazil in 1992. The invitation could be a sign of Brazil's readiness to cooperate in a global effort to preserve the environment, which would be a step forward from the first conference in 1972. Ailton Krenac, from UNI, remains cautiously optimistic. "I think that humans have a very strong survival instinct. I don't think that we are going to destroy ourselves. But I want us to stop, and do it quickly, because what we are doing is leading toward suicide." ■



*In Eastern Europe,
the two goals of transforming
economies and repairing
ecological damage
may lead in
one direction.*



A Green Wind Hits the East

INTERVIEWS WITH:

IMRE SZABÓ

UNDERSECRETARY OF STATE FOR INDUSTRY, HUNGARY

BEDŘICH MOLDAN

MINISTER OF THE ENVIRONMENT, CZECH REPUBLIC

JÁNOS VARGHA

ENVIRONMENTAL ACTIVIST, HUNGARY

IT doesn't take long for a visitor to discover some of the hurdles that Eastern Europeans face as they plan their futures. Within 20 minutes of my arrival in Prague, my host, a pesticide chemist, told me his university lab contains a hodgepodge of mismatched equipment, most of which is worthless for testing the agricultural chemicals used on—and remaining in—Czechoslovakia's food. In his own garden, he grows pesticide-free fruits and vegetables, but his goal is not to eliminate pesticides from Czech agriculture—at least not immediately. Instead, he wants Czech farmers to balance chemical and alternative methods of pest control to produce a long-term safe food supply.

This theme emerged repeatedly in my conversations with government officials and environmentalists in Czechoslovakia and Hungary—three of these interviews follow. The people I spoke with have embraced sustainable development, the idea that economic progress makes sense only if it can continue in the future. Sustainable agriculture would avoid depleting the soil of nutrients, and it would seek alternatives to dependence on expensive and potentially hazardous pesticides.

BY MARC S. MILLER

Economic
progress in
Eastern Europe
rests on the
immense task
of restructuring.

In fact, far more than does the West, Eastern Europeans treat *Our Common Future*, the 1987 report of the World Commission on Environment and Development, as a bible. This book popularized the term sustainable development and admonished nations to exploit resources without undermining long-term economic prospects. Political upheaval has created a chance to fashion systems that do just that.

In Hungary, ideas underlying sustainable development have been surprisingly central to political events. János Vargha and other opponents of a major Hungarian-Czech hydroelectric project took advantage of a political system that was open—by Eastern Europe standards—and started a mass movement. Early in the 1980s, Vargha decided that this project, funded largely by Austrian banks, posed an unnecessary threat to the environment, since it would, among other things, divert the Danube River and abandon the old basin. Hungary's share of the energy that would have been generated was needed only because Hungarian industry is highly inefficient; most of the electricity would have been exported to Austria.

Originally a plant geneticist, Vargha was then a journalist working for the ministry that oversees water resources. He founded the Danube Circle, which became the nation's most important opposition group. When political change came last October, the interim "government of reformed communists," as Vargha terms it, canceled Hungary's role in the project. Abandoning the unpopular venture seems high on the agenda for the new Czech government as well, although an almost-complete Czech dam, started years earlier, could operate independently.

As the East tackles development, sustainable or otherwise, there is a consensus that the root of the current state of affairs is a lack of "civil society." The concept refers to autonomous institutions—from scientific associations and independent labor unions to political parties and private businesses. Eastern European dissidents view such bodies as indispensable counterweights to government, as prerequisites to meaningful political discourse.

Consider the absence of discourse about environmental matters. In Hungary, Imre

Szabó, who oversees the energy program, as well as Vargha, often his opponent, condemn the inherited practice that charges a single body with both rapidly exploiting and protecting natural resources. As Szabó laments, "These are contradictory interests."

Such structural legacies remain, yet the current sense of possibilities is inspiring. Both Czechoslovakia and Hungary are revising their environmental laws and agencies, while new structures that look west for models are being created. Just as important, non-governmental organizations—a Western term adapted to the East's concerns—are proliferating to form a civil society.

Despite the commonalities, I was also struck by differences between Czechoslovakia and Hungary (and between these nations and Poland, the region's giant, and East Germany, where the West German factor dominates). For example, Hungarian environmentalists are still outsiders to official structures, although they were the "vanguard" of dissent. By contrast, every major Czech party stresses ecology, and Ivan Dejmal, once a political prisoner, heads Civic Forum's environmental group.

Vargha roots that contrast in history. After the 1956 Hungarian uprising was crushed, the government actually relaxed repression a little. The regime, Vargha says, "was very clever to make a compromise with the intelligentsia and buy them privileges financed with Western credits." Yet the advantages for dissidents were real. There was, he points out, "a little more possibility for autonomous actions. When we started to work on the Danube as an environmental issue, it was impossible to do it in Czechoslovakia."

Mild dissent could have landed a Czech in jail. However, when change did come—late but sudden—the nation's environmental legacy provided a platform for all major parties. Since over 80 percent of Czechoslovakians consider ecology the nation's number-one problem, Bedřich Moldan's immense task as Czech environmental minister is a little easier.

The greening of the East depends largely on greenbacks, and here, too, the situations of Hungary and Czechoslovakia are dissimilar. The Hungarian government's

policy of buying off the middle class has led to a staggering foreign debt. Hungary's \$20 billion bill in a nation of 10.6 million is the heaviest per capita in the region. (Poland owes \$40 billion and has some 38 million people.) That debt limits what is available for new investments, heightening the potential conflict between policies of rapid growth and sustainable development.

By comparison, Czechoslovakia, population 15.5 million, appears to abhor loans and has a moderate \$4 billion debt. A large industrial base also gives Czechoslovakia an edge, and plans are under way to convert the sizable arms industry to alternative ventures.

Still, common dilemmas predominate. Even Czechoslovakia wants some financial help and has asked Western nations for \$3 billion to stabilize its currency. And in both Hungary and Czechoslovakia, sustainable development—indeed, any economic progress—rests on the immense task of restructuring. At its simplest, this means getting rid of outmoded factories—and industries—and fostering “good” ones. That puts the focus on energy, a field in which sustainable development intertwines with economics, as is clear in the case of the controversial Danube dams. Every Eastern European nation wastes energy to an extraordinary extent. Hungary and Poland use about four times what Denmark does to produce the same amount of goods and services (*see the chart*).

The Soviet Union will continue to be the main trading partner for the region, especially as a source of energy, but Eastern Europe is turning west for technology, for experience in controlling it, and for partners in joint ventures. That street is two-way. In addition to many projects sponsored by Western Europe, at least 20 U.S. agencies are implementing the Support for East European Democracy Act of November 1989.

Some Western policies are controversial. Western lenders like the International Monetary Fund that condition further aid on austerity programs could limit money for sustainable development and, if unemployment increases, sap public support for long-term ideas. And some investments may be unwelcome: Western firms appear anxious to build a nuclear power plant in



ENERGY CONSUMPTION IN 1986 (SELECTED NATIONS)

COUNTRY	ALL ENERGY (MEGAJOULES PER DOLLAR OF GDP)	ELECTRIC ENERGY (KILOWATT-HOURS PER DOLLAR OF GDP)
Bulgaria	50.5	1.38
Czechoslovakia	51.8	1.46
East Germany	39.9	1.15
Hungary	62.3	1.82
Poland	64.6	1.73
Romania	44.4	1.05
Soviet Union	63.1	1.75
Austria	17.4	0.65
Denmark	13.4	0.51
West Germany	17.7	0.66

Hungary—an idea Vargha says continues the old-fashioned thinking behind the Danube project. Political opposition and high costs have already led to the cancellation of two Soviet-made nuclear plants in Czechoslovakia and one in Hungary.

Is the East's future green? Can it profit from Western achievements and mistakes to leapfrog into sustainable development? In a phrase heard time and again in both nations, “We will see.” Or, as one Danube Circle activist told me, “Everybody is invited to hope.” □

Eastern European nations all consume an inordinate amount of energy to produce goods for the economy. Thus, they all want to encourage efficient industries and upgrade inefficient ones.

IMRE SZABÓ

Providing Energy Security



*"Hungary
shall be a
bridge
between
East and
West."*

When I spoke with him in May, Imre Szabó had been Hungary's undersecretary of state for industry for several months. Because of Szabó's contacts with energy experts around the world, Miklos Nemeth, the transition prime minister, had recruited him from the Budapest Technical University. After the government changed hands the day of our interview, Szabó retained his post, although he delayed our conversation to say good-bye to the old minister of industry. Szabó's first words to me were, "Today at nine o'clock a new minister of industry took office. This is the starting point of the new system."

TR: As undersecretary, you are responsible for Hungary's energy system. What is your agenda?

SZABÓ: First, without ruining the Hungarian-Soviet industrial relationship, I have to try to stop the construction of a 2,000-megawatt Soviet nuclear unit. My second task is to maintain the supply of crude oil, natural gas, and electricity from the Soviet Union, which is and will in the future be our most important supplier of energy. Construction of the nuclear power plant has stopped, and an import agreement has been signed to supply crude oil and natural gas and so forth this year.

My last job is to provide for the security of the energy supply system by setting up new contacts for getting energy from other countries. Over the last three months, we have developed a new energy policy, and that process has involved the opposition—today they are the government.

TR: What will happen with the nuclear reactors already operating?

SZABÓ: We have four Soviet-made nuclear power units of 440 megawatts each, but these are not identical to the basic Soviet unit. Our Finnish colleagues used a new control and safety system on one of their Soviet reactors, and in a mutual project we developed a system tailored to Hungary's special requirements and based on Western technology. All in all, I would say that the safety of our units meets Western requirements.

TR: Coal supplies over a fourth of your energy. What role will it have in Hungary's development plans, given that the coal-fired plants contribute significantly to your pollution?

SZABÓ: Our coal-fired power stations were constructed 15 or 20 years ago, and some are much older. During the last three years, the key units have been rebuilt, and we installed the most up-to-date environmental protection technology. Fortunately from one side—and unfortunately from the industrial point of view—electricity consumption didn't grow in Hungary during the last couple of years, which is why our less-efficient power stations are not in operation.

Last week, I attended a conference of ministers in charge of environmental protection from all over the world. From the point of view of environmental protection, we did not fail, which means we didn't get a negative evaluation. At the same time, the representatives of Scandinavian countries and Austria submitted a suggestion to reduce carbon dioxide emissions to a certain level by the year 2000. Together with the United States and the United Kingdom, we didn't agree, because it seemed unrealistic. That level could be reached only if we stopped all our coal-fired units within 10 years and introduced nuclear units instead, which the population strongly opposes.

TR: As Hungary rebuilds its economy, how can you meet energy demand and protect the environment?

SZABÓ: We estimate that the total energy consumption will not increase more than 0.5, 0.6 percent a year, and electricity demand will not increase more than 1.5 percent annually. There are two reasons behind this. Our first priority is to restructure industry, and this will decelerate the economy as a whole so total industrial production won't increase. The other reason is savings that will result from energy conservation.

TR: Which industries are central to restructuring?

SZABÓ: The process has already started to reduce the traditional heavy industrial sectors. For instance, the output of the metals industry has been halved, and this half is more efficient than it used to be.

TR: Where would you encourage growth?

SZABÓ: Electronics is very important, and a new area is food processing. Hungary is an agricultural country, but there isn't as much food processing as there should be.

We have a long-standing tradition of biotechnology, which has developed through the pharmaceutical industry. The pharmaceutical and biotechnological research center in Szeged in south Hungary has an international reputation. However, we are behind in developing products, so we must make special efforts to set up joint ventures in this area. The Hungarian firm Kenoin and the Swiss company Bion have set up a joint venture, and we have connections with American companies as well.

TR: Hungary has a very high per capita foreign debt. What problems does that create?

SZABÓ: The policy of the International Monetary Fund is controversial. It's a contradiction, because if they require us to balance our national budget, we'll lose the possibility to improve our situation.

But we also have special projects to assist the Hungarian economy, sponsored by, for example, the European Community. These have to be considered separately. Their main objective is to introduce environmentally friendly technology. These aid projects are separate from the debt, but if we succeed in establishing a flourishing Hungarian industry, that might help solve the debt problem.

TR: How can Hungary have high environmental standards and still compete in Western markets?

SZABÓ: Basically, the high Hungarian requirements for environmental protection can't be kept. We have calculated that the investments needed to meet those requirements would spoil the possibilities for Hun-

garian products on the Western market.

Some large Western projects may help. Say Hungary wants to construct a new cement factory. For the additional investment to protect the environment, which has nothing to do with the cement production, one of the European Community projects may provide long-term credit at favorable conditions.

TR: What official bodies in Hungary currently protect its environment? Do they work?

SZABÓ: I don't like the structure we have. The main body is the ministry of environmental protection, which deals with the whole water economy—the regulation of the rivers, the irrigation systems, protection against floods. But there is a contradiction if this ministry is in charge of constructing the dam on the Danube, for example, and also has to protect the river.

At the same time, a strong body within the ministry of industry deals with environmental protection. This body deals with the environmental problems of power stations and chemical works. It would be useful if the ministry of agriculture and the ministry of transport had something similar for environmental protection. The ministry of environmental protection would provide directives for those organizations.

TR: How strong is public sentiment for protecting the environment?

SZABÓ: Protest is always local and against one single issue. We do not have a national organization independent of political parties, although we have the beginnings of this. For example, we have the Danube Circle (see the Vargha interview beginning on page 60).

But many times the protest is not oriented rightly. For example, very strong protest prevented the construction of a repository for low- and medium-level nuclear waste. The communal wastes must be disposed of somehow, but protest comes always from the place where we want to build a facility.

Frankly, we have very bad public relations between the people and the authori-



The new Agricultural Biotechnology Center at Godollo is a 40-minute drive from Budapest. The \$30 million investment symbolizes the direction—and cost—of Hungary's hopes to transform its economy.

ties, because during the last 40 years, the public was not informed and not asked for permission to build a new project. Now we have no time to do so: we have to decide where and how to dispose of our nuclear wastes in only three years.

TR: As the economy is restructured, unemployment will probably rise. How will that affect public attitudes toward environmental protection or other investments?

SZABÓ: I think we can find a way to have people accept the new investment policy by taking into consideration those who would become unemployed. For example, the local population did not accept a new chemical-waste burning system, but where we provided new roads, telephones, social services, and jobs, they accepted our projects. Maybe rising unemployment will help to carry out new industrial investments.

TR: So unemployment will make people more interested in industry than in the environment?

SZABÓ: Absolutely right.

TR: What role does trade, with the West and the East, play in development?

SZABÓ: This is a difficult issue. The most important step is to develop bilateral trade relations with Western European nations while maintaining our traditional Soviet and Eastern European connections. Hungarian industry has been basically oriented to Eastern Europe and the Soviet Union. Because of a substantial trade surplus with the Soviet Union, we have had to limit those exports. We have increased exports to the West, but not enough to compensate for the reduction in Soviet exports.

A well-known trade expert from Western Europe visited me the other day, and he asked, "How come every Western country would like to get into the Soviet market and you want to retreat from that?" I told him that personally I did not agree with the limits on the Soviet exports. A key issue is that Hungary shall be a bridge between East and West trade. That's the role I see for Hungary. □

BEDŘICH MOLDAN

Undoing a Totali- tarian Legacy



"The Czech Republic is probably the most polluted land in Europe."

In December 1989, Bedřich Moldan became minister of the environment for the Czech Republic, the eastern half of Czechoslovakia. Much of his work derives from the absence of any equivalent federal body, and after decades of a strong central government, he explains to local authorities that they must create their own systems to protect the environment, just as the country as a whole must develop new national structures to replace the old ones. Moldan is a geologist and a specialist in acid rain.

TR: How strong is sentiment in Czechoslovakia for sustainable development?

MOLDAN: Very strong indeed. Eighty-three percent of our population thinks that solving environmental problems is the most essential thing for the government to do. The public support is a source of my hope. All information is available, and all the members of government know that the environment is important. But of course the realization is not enough. We must do things, and that is difficult given our present economic situation.

TR: As a scientist, how did you get involved in politics?

MOLDAN: I worked in the geological survey and in the early '70s realized that there are such things as environmental problems. In the '80s I realized that these are very pressing in Czechoslovakia. I worked in a sort of non-governmental organization, the ecological section of a biological society of the academy of sciences. We were in principle legal but rather independent and balancing on the edge of what was allowed. We held meetings and seminars and made translations from English and produced a little report on the environmental situation. We submitted it to different government bodies and of course nothing happened.

TR: What are the chief environmental problems you must deal with?

MOLDAN: The new government is only just formulating its policies, and there is one big obstruction, the inherited structure. The most important questions are solved

on the federal level, but with no environmental ministry on that level, there is no sustainable-development policy. The most pressing problem is that our people got used to a socialist totalitarian system. People understand that that is in the past, but there is no replacement yet.

In general, the Czech Republic is probably the most polluted land in Europe. For instance, any foreigner who goes to north Bohemia [eastern Czechoslovakia] is shocked by our strip mines and our chemical factories and power plants. The cities are dilapidated, and all the environmental errors you can imagine are there, with perhaps one exception: people still have good drinking water. Whole forests are gone. Tens of thousands of hectares of spruce are nonexistent—not just suffering, nonexistent.

Perhaps the worst problem is in solid-waste management, because we are just writing the law for that. We have had an air pollution law for 25 years. It's not very good, but still something was done.

TR: Was that law enforced?

MOLDAN: Not fully. First of all, people didn't observe the law. At the same time, the standards were too strict—it was impossible to meet them. That created a situation that was good for a totalitarian system. Nobody could obey all the rules, so "good guys" were allowed to not obey, but if I wanted to punish you, I could take any law, like the air pollution law, and say you were a "bad guy."

TR: The economy depends on coal a great deal. Does Czechoslovakia plan to move away from that?

MOLDAN: Difficult question, but we should not resort to nuclear energy—or at least only to nuclear energy. First of all, we must vastly increase our energy efficiency. This is our first priority, to restructure industry away from polluting, heavy industry. Then we must look at foreign cooperation and import fuels and perhaps even energy. We need to be very clever and select our mix of fuels.

TR: What are Czechoslovakia's resources



as it tries to start a sustainable-development policy?

MOLDAN: The financial sums that we need are big, but I think the money must come from polluters. Right now, of course, we must have some money, but it's not easy. The money is not in our ministry. It's in the other ministries, say the ministry of industry, and they must clean up their own areas. We have the resources created by the state budget, but they will be shrinking because we are on the road to private industry, and no resources are being created for the transition period.

One thing we are almost sure of is that we shall not seek foreign aid in the form of huge credits. Credit means debt, and this is not very good. Where we seek foreign help is in technical assistance. We have basically a rather good industry, but we need know-how and licenses. We need some critical parts.

TR: In some sense, won't removing the government's control of the economy pave the way for more pollution?

MOLDAN: Economic deregulation doesn't mean that we shall not reinforce our laws. I am looking forward to deregulation. We must have tough laws, and this is enough. In the former days, the polluter and the regulator were one person. This cannot work. You need independent insti-

Czechoslovakia's large industrial base is a major asset. For example, the country imports few cars, producing most of its own at the Skoda auto company.



Air pollution has blackened most of the centuries-old statues that help make Prague one of Europe's most beautiful cities.

tutions for evaluation and control.

TR: What progress have you seen so far toward a sustainable agriculture or industry?

MOLDAN: In fact, no material progress, but I've seen new people and new plans, and some of the most stupid policies have already been changed.

I think the arms industry will be almost completely converted to other purposes. Right now there is a process to do that, especially in Slovakia. When they list the main problems they have, converting military production is always one of them. This is a big problem, but, on the other hand, these plants could be a source of industrial capacity to make other things, maybe pollution abatement equipment.

I think that first people must be educated, and they must understand what's going on. This is the foundation. Without it, you cannot proceed. □

JÁNOS VARGHA

Incentives for New Thinking



"The most complex technology is a stone axe compared with small bacteria."

Environmentalist János Vargha has been a leader in Hungary's political transformation. He founded the Danube Circle, which cost him his job at the Hungarian edition of *Scientific American*. The circle went on to pioneer protest methods, including public demonstrations and petitions to the government, that other dissident groups could imitate.

While the new government would have welcomed him, Vargha chooses to operate in the "civil society." He has started Ister—that's the ancient Greek name for the Danube—to conduct research on sustainable development, and he runs the Budapest office of the Panos Institute, an international research organization with the same goal. While Szabó melds the old and new regimes, Vargha envisions new paths for Hungarian—and global—society.

TR: What ecological problems does Hungary face?

VARGHA: We more or less suffer from the perfect development of the first generation of technology. Hungary had no secondary industrial or technical evolution. There are some seeds of a new technology or a post-industrial society, but they represent only a possibility to change the situation.

Second, this society didn't develop the ability to find proper answers for environmental problems. One reason was the control of the flow of information. Another was the lack of capacity of the civil society to look for alternatives.

TR: As Hungary develops, what will assure that the environment is protected?

VARGHA: We have quite good environmental standards. The problem is that there is not enough pressure from the civil society, so the standards are theoretical. I don't wait for a leading role from the state administration—this is not its nature—but more and more environmental associations, institutes, and groups will be established and cooperate with one another. After having one Danube Circle, now we have Ister, a green club in the technical university, a nature protection group in the scientific university, the Independent Eco-

logical Center, etcetera.

There is considerable environmental consciousness but not enough. There is a flood of information after the long period of censorship, but people have lost the ability to analyze information. For example, we lack at least one generation of ecologists. We have to collect the data, analyze it, translate it, initiate public activity, and pressure political structures and industry.

We would like to bring fresh wind into the thinking. Some traditional tracks are strongly imprinted into the old brains. Sometimes it's not only a question of interests. Sometimes the problem is that we didn't have incentives for new thinking.

TR: Hungary has canceled plans for a new 2,000-megawatt nuclear reactor. Was that because of public pressure?

VARGHA: No. These reactors are too big. They may be more risky than the existing 440-megawatt reactors. If you increase the size of a certain quality reactor, the risk will increase exponentially. It would have been expensive to change the old safety system, to buy technology from the West. And these reactors may be expensive to run.

Another important factor is that the energy sector had become a malignant disease. It became so big and so ineffective that it threatened economic reform. It absorbed a very high proportion of investment.

TR: What steps could Hungary take toward building a sustainable economy?

VARGHA: Because energy efficiency is so low, it will be easy to improve it. Industry uses 75 percent of the electricity, so it's the main target. It isn't proper to tell citizens they are responsible for saving energy, don't use your lamp, go to sleep earlier. We have to restrict some industrial activities that are big consumers, like aluminum production. We have old open aluminum smelters that seriously pollute the environment and consume a great deal of electricity.

I also think we have to partially privatize the energy structure. California has many independent power plants. If a community or a factory or a farm has a small power plant, it can produce electricity for a whole network. California's total in-



dependent capacity is about that of Hungary, but it is controlled by I don't know how many thousand power plants. Nine power plants account for more than 90 percent of Hungary's electricity production.

However, this process may be seriously endangered by the efforts of large Western companies to build nuclear power plants in Hungary. I know about Westinghouse. I know about Electricite de France, and a Canadian company. They don't even want to supply Hungary. They would like to export electricity to Western Europe.

TR: What technology do you seek from the West?

VARGHA: One example is the biomass-fired gas turbine being investigated at Princeton. Researchers have studied these turbines in the case of Latin American sugar factories, where there is large biomass production. Hungary is also an agricultural country with a large production of biomass. We need to invest in technologies to process domestic resources—those used in the food industry, for example. And we need investments in infrastructure, such as communications.

TR: As Hungary moves to free markets, unemployment could rise. Will people lose sympathy for environmental protection?

VARGHA: It will be very easy from a technological viewpoint to create many new jobs that use environmentally acceptable technology. The question is more political, a question of people's attitudes. In urban

Hungarians are forming the independent organizations needed for meaningful democracy. In 1989, many of the new alternative associations and trade unions met in Budapest.

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One month after coming to power, Hungary's reform government won some popular support by stopping construction of the Nagymaros dam on the Danube River.

regions, more and more people are not needed and are forced to have a very low standard of living. How can we find a way for them to migrate to parts of the country where natural resources like agricultural land are not utilized? With the technological and financial support of the state, we have to create situations that tempt them to move and cultivate the land in an environmentally acceptable way. This should be an important element of agricultural and social policy.

TR: Won't International Monetary Fund loans that are conditioned on austerity exacerbate unemployment?

VARGHA: This is a question of the national debt. It's a kind of blackmail. The Hungarian policy is that it is our duty to repay all interest on time, but I don't think so. Just as Mexico's debt was decreased enormously because of political considerations, the same must happen with East Europe. Another political consideration is that in the last 10 or so years, Western credit helped the communist regimes survive.

TR: Austrian banks want compensation for their investment in the dam. Should Hungary compensate them?

VARGHA: My opinion, which the Austrian greens share, is that the Austrian government guaranteed this business in 1986, so the companies can go to the Austrian government. Austrians had stopped a dam project at Hainburg on the Danube in '84. Then Austria came to Hungary to build the Nagymaros dam. We petitioned the Austrian parliament not to do this in '86, before the guarantee. They were informed that a movement in Hungary was against it, and they had had experience in Austria, but they assumed that the police would protect them in Hungary. The Austrian government is responsible. They cannot say, "We are innocent, we didn't know." They tried to abuse the lack of democracy here.

TR: Austrians tried to put an unpopular dam here. Westinghouse wants to build reactors. Are some Western firms and nations treating Eastern Europe like a Third World nation?

VARGHA: Exactly. It's a question of whether we will have enough force and skill to stop this. I am sure that we will get a lot of help from environmental organizations in Western countries. If you consider how the World Bank started to change after criticism of its investments in the Amazon, international solidarity may provide good competition for Westinghouse and Electricite de France.

TR: What do the words free market and free enterprise mean to you?

VARGHA: I very much oppose any state ownership in production. The task of the state is to create limits for private activity, to surround the market and protect other values on a consensus basis.

The free market economy causes very serious social problems, such as poverty. There were two answers to this. One was Marxist: private property is dangerous because it cannot be controlled. We have science; we have brains; we will construct a new system in which everything will be planned. The other option was more spontaneous: the development of social

democratic movements, civil society, charity organizations, efforts to build a border around the market. In the same way, it may be possible to develop environmental institutions.

I don't want to say I am very optimistic, but I think we will cure ourselves of several wrong approaches. One is the utopian belief that there is a perfect social system. The second is techno-optimism, the idea that we can solve everything with technology. More and more people are losing their belief in the infinite power of technology.

There is a clear trend for technology to become more complex, to move toward a system in which we cannot play a leading role and have to restrict our ability. If you drive a car, you can't think freely. Your fantasy is limited to a few reflex circles in your very complex nervous system. It is as if you used a violin to beat a nail.

We have to realize that the very deep effort to develop technology hasn't produced any values comparable to the simplest cell. The most complex production, the Apollo system or the space shuttle, is a stone axe compared with small bacteria. ■

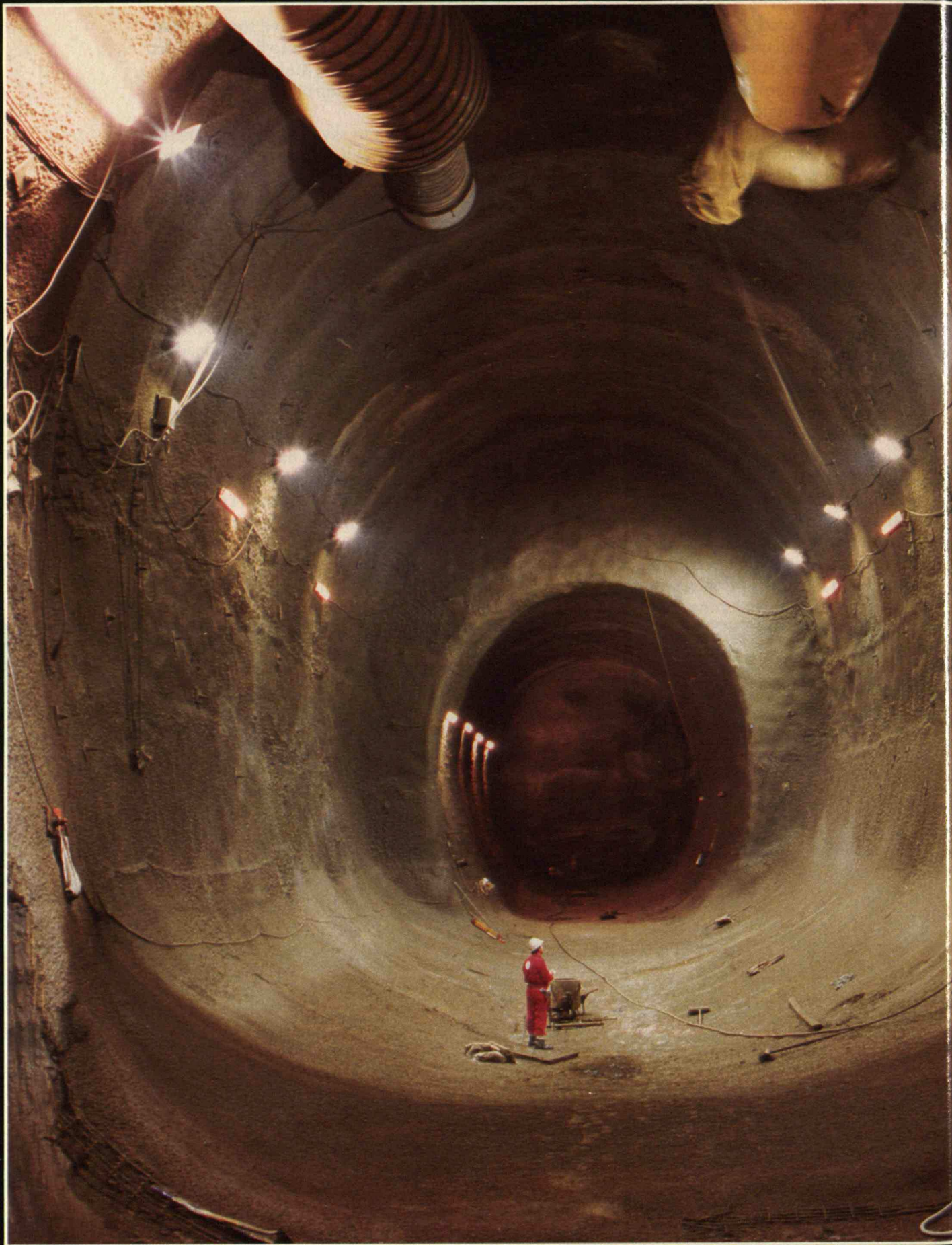
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A PHOTO ESSAY
ON THE CHANNEL TUNNEL

The Big Dig

BY LAURA VAN DAM

It almost sounds like a child's fantasy of digging to China. Come November, should everything work out right, English workers boring toward France should meet their French counterparts under the English Channel. Then, for the first time since the Ice Age, there will be a permanent link between mainland Europe and England.

The feat will result in a service tunnel that will be at the center of a three-tunnel railway operation. The Channel tunnel system—also known as the Chunnel—is a project dreamers, engineers, and others have proposed since the days of Louis XV and futilely attempted a number of times.

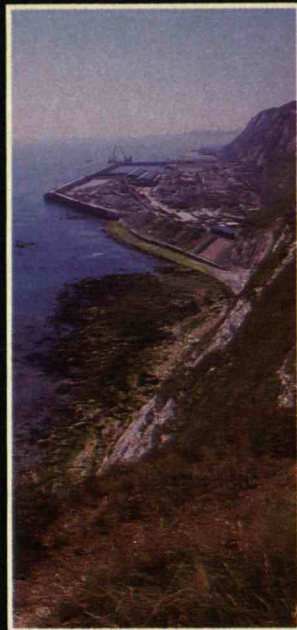
Even on this round, for which construction started in December 1987, the project has battled a host of problems. The current expected price tag is almost £7.7 billion, up 57 percent from about £4.9 billion in January 1986. (The original estimate equalled \$6.9 billion, but comparing the current anticipated cost with American dollars would not be fair because of the dollar's drop in value.) The new estimate, in fact, required Eurotunnel, the builder, to start raising £2.5 billion more in loans and stock last May. And despite interest in making the tunnel part of a high-speed link between London and Paris, only the French are building such a rail connection—from Paris to their tunnel entrance near Calais. British Rail plans for a high-speed line from London to the tunnel entrance outside of Folkestone are still on the drawing board. There have also been environmental, terrorism, and safety concerns (10 workers have died in connection with the project) and even some British handwringing over the idea of losing their island status.

But work has continued. Billed as the largest civil engineering project in Europe, the Chunnel is expected to open in late 1993. Some 82 million passengers should cross the Channel then, according to Eurotunnel consultants, up from 60 million in 1988.



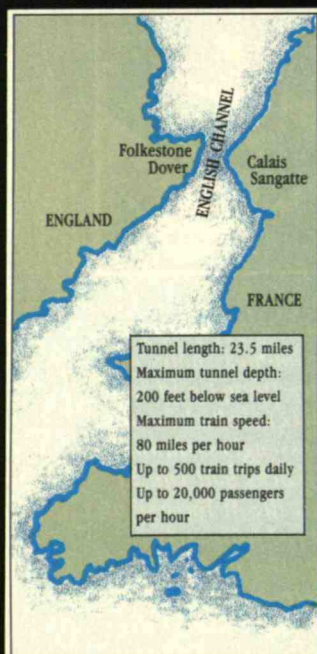
Above: A model of part of the completed complex shows an inner service tunnel and two outer tunnels in which trains carrying passengers, automobiles, and trucks will run in long loops. Left: At the end of this tunnel, which is reinforced with steel and sprayed with concrete, is the soft gray chalk marl that workers dig out at a daily rate of 95 feet.

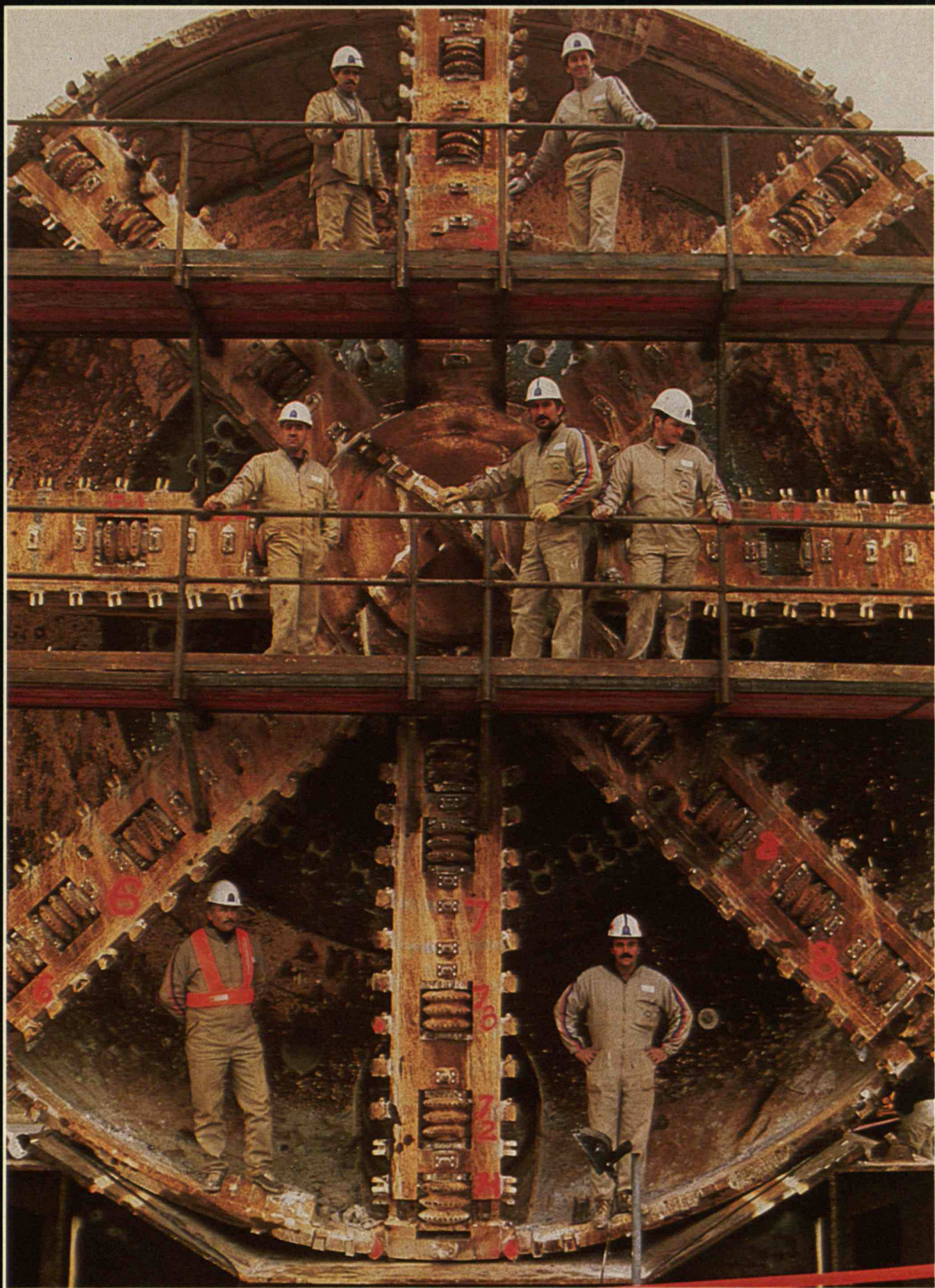




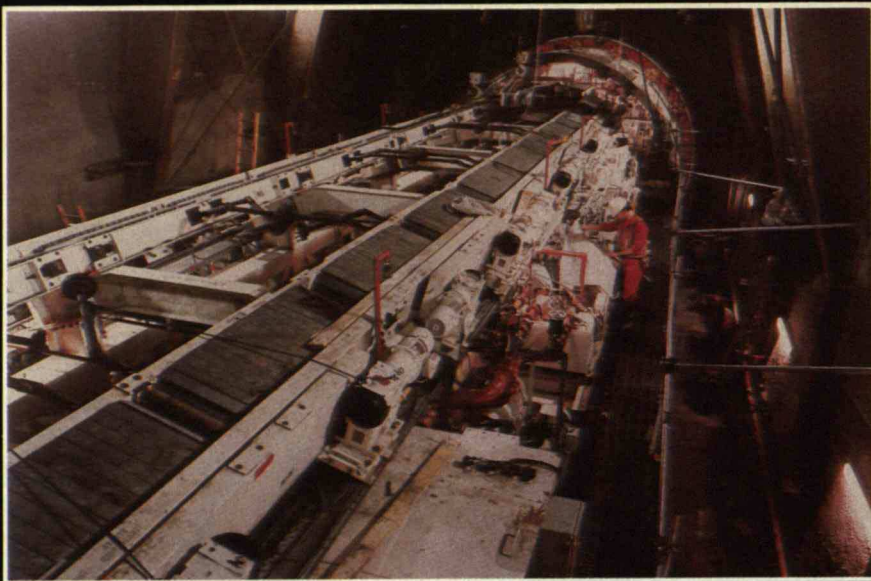
Above: British undersea construction starts at the base of one of the famed white cliffs of Dover. The site's buildup of excavation spoil covered an area of interest to marine biologists and earth scientists. Eurotunnel agreed to reduce overall construction-related environmental damage.

Bottom left: Workers reach the English marine construction site using an elevator from the top of the cliff. Top left: The six boring machines used in the project are so large and so long that most were assembled in underground "cathedrals" 65 feet high. Right: The front of a boring machine contains tungsten-tipped picks that workers inside guide using laser projections on video screens.





PHOTOS: QA: DAVID GEORGE, GAMMA-LIAISON
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Top left: Boring machines also remove spoil, carry lining segments, and haul grouting and maintenance equipment. About 30 people work in each machine. Top right: After boring, machine workers retract the head and bring forward lining segments that they then place around the tunnel's inside surface. The thickness of the steel-reinforced concrete segments partly depends on the weight of the rock above. In some places, concrete sprays and toughened PVC are also used to keep water out. Bottom right: Inside the lined tunnel, small trains carry debris, supplies, and workers.





Above: Because of poor, wet ground on the French side, the entrance to the marine construction site there was built as an access shaft almost 250 feet deep, with an outside waterproof wall. Left: Workers hail a "break-through" as a boring machine finishes its trip from the marine construction site to the French terminal site, where users will enter the tunnel.

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CHARLES PANATI

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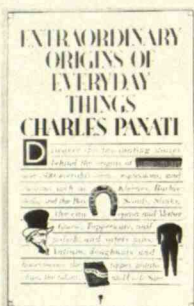
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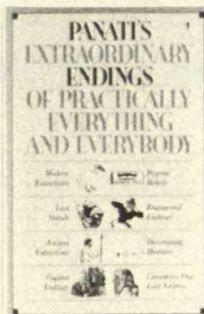
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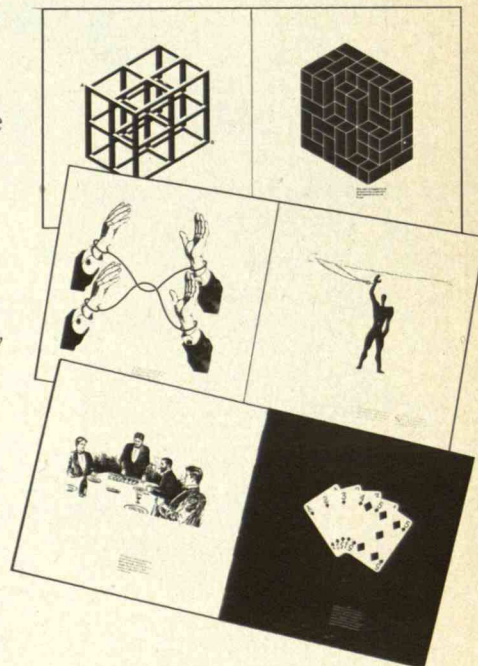
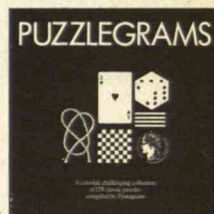
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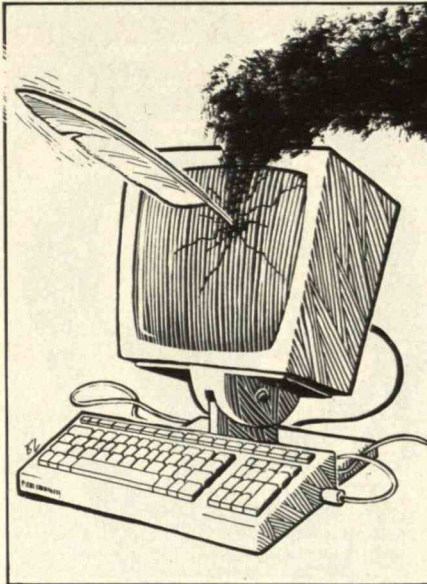
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Poets vs. Technology

Is it preordained that poets deplore technology? Must creative artists, those people who celebrate blossoms and rainbows and explore recesses of the human heart, inevitably view engineers as adversaries? Regrettably, it sometimes appears that the answer is yes. Although public anxieties about technology have abated in recent years, the private misgivings of many writers have not. Engineers, like all citizens, are disturbed about environmental degradation, dangerous consumer products, and the arms race; they seek a cleaner, safer, more secure world. But still a fundamental mistrust of technology lies deep in the artistic psyche.

I pick up the *New York Times Book Review* and find an essayist lamenting that romance is not what it used to be, and that science and technology are largely to blame: "Technology is the knack of so arranging the world that you don't have to experience it." In the *New York Review of Books*, a writer appraising the papers of Thomas Edison speaks of engineering as "an alien power, crippling the sense of freedom that it was intended to serve." In his introduction to an anthology of contemporary American poetry, Andrei Codrescu writes that "the making of community against antisocial technology is the chief object of the poetry gathered here." He goes on to complain that "it's been our generational lot to sift through the debris of industriality [sic] to force reality through the cracks." In his book *The End of Nature* Bill McKibben voices an elegiac dread of technological change. McKibben tells of retreating to an Adirondack wilderness, where he finds sublime detachment swimming in a remote lake. But the roar of a motorboat rudely breaks the mood. When technology intrudes, McKibben writes, "you're forced to think, not feel."

One cannot quarrel with a person who values feeling, nor with the ideals of love or freedom. But why cast technology as the enemy? There have always been obstacles to achieving the euphoric states of being so celebrated in song and story. In earlier times, people faced with such harsh realities as failing crops, plagues, and marauding war parties must often have



*Creative
artists should stop
treating technology as if
it were the chief source
of human discontent.*

been distracted from ardent amours and blissful swimming sessions. Technology doubtless has changed the nature of life's diversions, in ways both pleasant and unpleasant, but I do not see why it has to be viewed as hostile to artistic fervor.

I do not expect contemporary poets to echo Rudyard Kipling's paeans to machinery, or to emulate the great yeasayer, Walt Whitman, "Singing the strong light works of engineers." I forgive them if they do not understand the passion inherent in engineering enterprise and ignore it in their work. I merely want them to stop treating technology as if it were the chief source of human discontent.

Little enough to ask, one might think, yet repeatedly I find reasons to feel discouraged. Even as I write at my word processor, I am reminded of Wendell Berry's recent diatribe against this harmless tool in his book of essays *What Are People For?* Berry chooses to continue writ-

ing with a pencil, not merely out of personal preference, but as a statement of protest against high technology. His wife transcribes his work on a typewriter bought in 1956, a machine that is "as good now as it was then."

No engineer can speak to the concerns of creative artists as effectively as can one of their own, so I find comfort in referring to the wisdom of writer John Updike. "I use a word processor," writes Updike in a recent essay, "and the appearance on the screen of the letter I just tapped seems no more or less miraculous and sinister than its old-fashioned appearance, after a similar action, upon a sheet of white paper in my typewriter."

Machines simply do not bother Updike the way they do Berry. Having pondered the matter, he states the reason: "The capacity of human beings to absorb what they wish to and to ignore the rest," he writes, "seems to me almost illimitable." Updike fails to see how the human spirit is threatened by the computer, or by the carburetor, which responds "when I simply asked my automobile to go," or by the telephone, which has not fundamentally changed what people talk about. Perhaps Berry, McKibben, and similarly troubled souls could also cultivate the capacity to ignore those aspects of technology that do not answer to the cries of their heart.

Happily, Updike is not the only poetic creator who finds it possible to cope with technology. Let the last words be those of another luminary of the literary world, Saul Bellow:

"A million years passed before my soul was let out into the technological world. That world was filled with ultra-intelligent machines, but the soul after all was a soul, and it had waited a million years for its turn and did not intend to be cheated of its birthright by a lot of mere gimmicks. It had come from the far reaches of the universe, and it was interested but not overawed by these inventions." ■

SAMUEL C. FLORMAN, a civil engineer, is the author of *Engineering and the Liberal Arts*, *The Existential Pleasures of Engineering*, *Blaming Technology*, and *The Civilized Engineer*.

Polishing the Rustbelt

FOR the past decade, economists and politicians have been proclaiming that high technology would breathe new life into smokestack America. High tech companies were supposed to be a kind of white knight; joined in partnership with universities and state governments, vibrant companies would create jobs and help revitalize downtown areas.

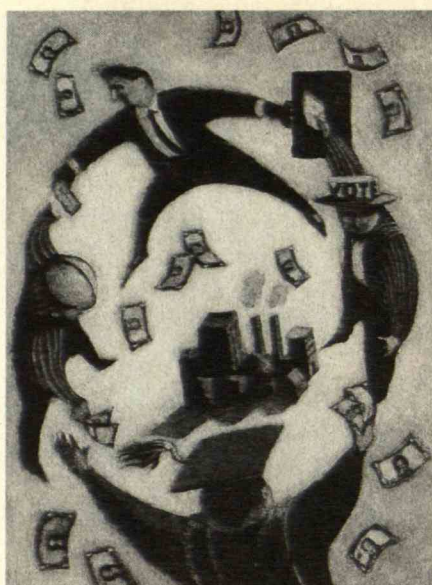
The punch line: Sometimes, it really works. Consider the following case from one of the capitals of old smokestack America. In Pittsburgh, a start-up company called RedZone serves as a near-perfect example of how high tech revitalization can go right.

To begin with, RedZone grew out of a university. In the wake of Three Mile Island and Chernobyl, several engineers at Carnegie-Mellon University's Robotics Institute became convinced that the maintenance and cleanup of radioactive environments would turn into a growing, and lucrative, market. The Institute created the Field Robotics Center to focus on this technology. In 1987, the Field Robotics Center itself spun off a company to build robots for use in such dangerous environments.

RedZone's robots are designed to navigate through the hazardous areas, collecting data using environmental sensors. While factory robots typically perform one or a few highly specialized functions and remain bolted down in a controlled environment, field robots must be versatile and mobile. The robots enter their measurements into a database, build computer models of the site, generate graphic displays, and then transmit the data to operators safely based at remote locations.

Some heavy industrial hitters are teaming up with RedZone. Westinghouse Electric's servicing business for nuclear reactors already collaborates closely with the small company, and Boeing Aerospace and RedZone are exploring a partnership to develop robots for outer space.

RedZone is also developing a portable device that can be waved over the ground like a modern-day divining rod to sense



*A Pittsburgh
robotics start-up shows what can
go right when government,
business, and academia
are on the same side.*

underground pipes and cables. Several million miles of gas and water pipelines and electrical and communication cables are buried beneath the surface of the United States. Maintenance of this equipment is difficult because frequently no one is certain where to dig. Maps are often out of date, and subsurface soil movements can cause pipes and cables to shift.

This project exemplifies the kind of university-business-government partnership that is so important for revitalizing Rust Belt urban areas. The pipe-mapping device, which uses magnetic resonance imaging, was invented by Carnegie-Mellon's Robotics Institute as part of work funded by Southern California Gas. (The country's natural gas utilities lose as much as \$300 million a year by either missing or damaging underground infrastructure.) And Red-

Zone is receiving partial financing for its work from Pennsylvania's Ben Franklin Partnership, a state program that invests in high tech companies.

RedZone is a boon to downtown development. The firm is working with the city's redevelopment authority to acquire and renovate new space to assemble and test its robots. RedZone is planning to locate the facility in the heart of a colorful district that has traditionally been the center for the wholesale and retail food companies operated by Pittsburgh's ethnic community. "We want to be where the action is," said one of the directors recently, "not off in some suburban industrial park."

RedZone's economic influence will spread beyond the downtown area. The components used in its robots will be made by the same blue-collar workers who populated the region's steel and nuclear reactor companies. Most of these machinists work in small shops in the Monongahela River Valley southeast of Pittsburgh. The Steel Valley Authority, a quasi-public state entity run mainly by steel union activists, is helping RedZone find suppliers in the valley towns, and get financing for its projects.

The public investment in RedZone has been modest—about \$10,000 to \$12,000 per job created. And the future looks bright: Revenues are projected to grow by 250 percent between 1990 and 1992. As the U.S. and foreign governments tighten radiation-exposure regulations, and as an environmentally conscious society demands more frequent cleanup of hazardous wastes, the need for RedZone's robots will increase.

Most important, RedZone is demonstrating that urban industrial revitalization, the marriage of high technology with mature business, and alliances between government, business, universities, and unions are more than just rhetoric. That is precisely what good technology policy ought to be about. ■

BENNETT HARRISON, visiting professor of political economy at Carnegie-Mellon's School of Urban and Public Affairs, is on leave from MIT's Department of Urban Studies and Planning.

nineteenth-century education and in early caste-equality struggles in Kerala. But the role of this religion should not be exaggerated. In 1901, after a century of intense Christian mission activity, only 11 percent of Keralites were literate, including less than one-half of one percent of the (then) untouchable caste. The major expansion in literacy took place after 1900 under the secular auspices of enlightened Hindu rulers and radical peasant and worker movements.

RESEARCH IN THE ARCTIC

Alaska is doing something about the funding problems David Baltimore describes in "Research Endangered" (*TR May/June 1990*). After watching federal dollars for Arctic research dry up over the years, we figured it was time to swing into action. In 1988, the Alaska State Legislature created the Alaska Science and Technology Foundation and endowed it with \$100 million.

The foundation's board consists of scientists (two must be from outside Alaska) and private-sector people with technological expertise. There are only four employees. The \$7-8 million given out each year is usually matched by "outside" money, and all funds are awarded through competitive grants with peer review. Applied science is the rule, but "pure" science is expressly authorized. Also, the projects have to be aimed at something that would benefit Alaskans.

Alaska has a lot riding on good science, so for us research is a sound investment. It isn't the federal government's job to take care of all Alaska's research needs. Some of the responsibility is ours.

For further information, write to John Sibert, director of the Alaska Science and Technology Foundation, at 550 West 7th Avenue, Suite 360, Anchorage, Alaska 99501-3555.

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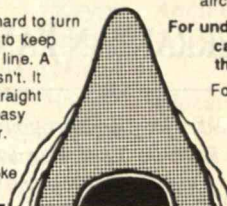
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Reviews

BOOKS

SUBTERRANEAN FANTASIES

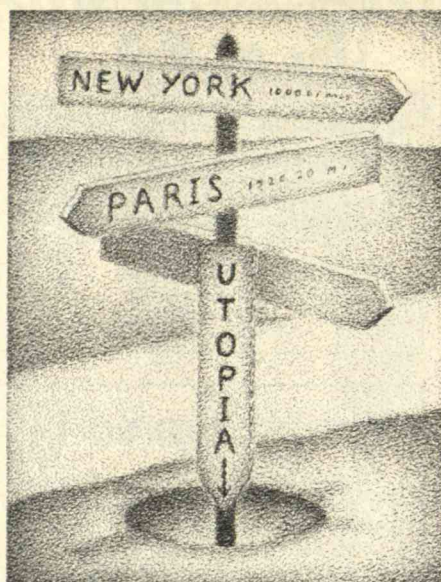
Notes on the Underground
An Essay on Technology, Society,
and the Imagination
by Rosalind Williams
MIT Press, \$24.95

BY KAREN ROSENBERG

LEVEL 7, a novel about nuclear war, scared me half to death in my early teens. The claustrophobia of an underground bunker, where the inhabitants gradually die from radiation sickness starting with the uppermost and ending with the deepest and most privileged level, is imprinted on my memory. Nuclear war was being talked about around 1959, when this novel by Mordecai Roshwald appeared; those were the days of "duck and cover" drills in school and of fallout shelters in the backyard. Science fiction not only articulated but also intensified a current obsession.

Having experienced the power of a novel about the underground, I can understand why Rosalind Williams chose this subgenre as the focus of *Notes on the Underground*, her book about an earlier traumatic period, the Industrial Revolution. The journey to the underworld captured the imagination of engineers, archeologists, and novelists in the nineteenth century. Yet the energy that much of this exploration generated can be read as a sign of anxiety as well as enthusiasm. In nineteenth-century literature, Williams shows, characters often descend into the earth to escape from the fallout of the Industrial Revolution—class conflict, overcrowding, war, and a butchered landscape—only to find other problems underground.

Most of the books Williams looks at are pretty obscure. If the greatest literature transcends its time, schlock does not, and so makes terrific fodder for cul-



tural historians. I am grateful that Williams is willing to wade through novels about life underground such as Edward Bulwer-Lytton's *The Coming Race* (1862), William Delisle Hay's *Three Hundred Years Hence* (1881), and Gabriel Tarde's *Underground Man* (first published in French in 1896), which I can safely bet I'll never open. Even the plot summaries are a snore, though Williams's analysis more than makes up for them.

But Williams is also interested in the works of Jules Verne, whom many generations have not found dull. Verne's books, which have been relegated to the status of children's literature, are better known than the obscure titles by Bulwer-Lytton or Tarde, but that does not make them well understood. As Williams clearly shows, *Twenty Thousand Leagues Under the Sea* (first published in 1869–70) contains much more than the gee-whiz gadgetry that impressed me in my preadolescence.

It turns out that Verne was something of a social theorist. He sets some of his ideal societies underground (or underwater) because he could structure these unreal, enclosed environments according to his imagination. For him, and for some other nineteenth-century writers, Williams notes, the underground served as a "subterranean laboratory" for fictional social experiments.

Verne's political orientation is difficult to pigeonhole—even contradic-

tory, according to Williams. Like the utopian socialist Saint-Simon, Verne believed that harmonious cooperation would result when people worked together on scientific projects. He also had a recurrent fantasy that workers would no longer be exploited if human labor were replaced with technology. At the same time, though, the utopian promise of the Industrial Revolution goes unfulfilled as Verne's ideal technological societies fall prey to despotism. In *Twenty Thousand Leagues Under the Sea*, the son of an Indian raja, unable to liberate his people from the British, leaves land to find a free environment, but imprisons and enslaves three passengers in his high-tech submarine. In *Black Indies* (1877), a subterranean community is threatened by a property-hungry madman and responds by instituting a police state. Because Verne displays such hostility toward authority, it is not surprising that one critic has called him a closet anarchist, another an underground revolutionary.

Williams's discussion of Verne's and other underground utopias reveals an important point about much science fiction: futuristic vehicles—the spaceships, time machines, and submarines that fascinated me when I was a kid—are often red herrings. What's important in the literature Williams discusses is less how characters travel than the nature of the communities where they end up. As the British literary historian Raymond Williams puts it in an essay called "Utopia and Science Fiction": "The mode of travel does not commonly affect the place discovered."

Literature and Social Change

I mention Raymond Williams because he shares more than a surname with Rosalind Williams. Both Williamses—as well as Theodor Adorno, Walter Benjamin, Eric Hobsbawm, Terry Eagleton, and Frederic Jameson (all of whom appear in the footnotes to this book)—are part of a Western European and American movement to reinterpret Marxism so that it does not oversimplify the relationship of literature to social

change. Gone is the simpleminded determinism so popular in the Stalin era that teaches that art merely depicts preexisting socioeconomic conditions. While Rosalind Williams writes that nineteenth-century novels about the underground express anxieties spawned in authors and readers by the Industrial Revolution, she also shows a reverse process, whereby imaginative works inspired the use of technology in the real world. (One does not have to be a Marxist to make such observations, but many historians who relate art to its social context have, whether they acknowledge it or not, been influenced by Marxist theory.)

According to Williams, the journeys to the underworld dreamed up by fiction writers shaped nineteenth-century science. For example, excavation—including mining and the building of tunnels, subways, and urban utility systems—“was cast in mythological terms, as a heroic journey into forbidden realms.” In fact, a mid-nineteenth-century Baedeker guidebook recommended that tourists visit Parisian sewers—and they did.

Technological practice and aesthetic discourse cross-fertilized each other, and so should not be viewed separately, her study suggests. With the Industrial Revolution, for example, writers expanded the aesthetic concept of the sublime—a feeling of awe evoked by immense size and grandeur—to apply not just to mountains and volcanoes but to technological wonders such as mines and electrically lighted caves. A taste for the sublime even influenced the development of the city, with its illuminated commercial arcades. “The fantasy of the enclosed artificial environment has flourished, primarily because it is so marketable,” she asserts. To judge from today’s proliferation of vast underground shopping malls, a taste for the sublime still influences the way we shape the world.

But sublimity is only part of what attracted nineteenth-century writers to the underground. In counterpoint to the view of nature that dominated the Industrial Revolution—that nature is a

mine to be excavated to serve human needs—was a budding conservation movement that appreciated nature for its own sake. “The more human-made structures degrade the natural environment, the more alluring becomes the self-enclosed, self-constructed paradise,” writes Williams. “Technological blight promotes technological fantasy.” ■

KAREN ROSENBERG is an independent scholar whose articles on the politics of culture have appeared in journals in the United States, Western Europe, and Japan.

BOOKS

FOOD FIGHT

*Appetite for Change:
How the Counterculture Took on
the Food Industry, 1966-1988*
by Warren Belasco
Pantheon Books, \$24.95

BY ANNE MARIE DONAHUE

THERE was a certain whimsy to the counterculture’s war on the food industry back when the battle lines were being drawn. Late one afternoon in October 1966, a band of ecological activists dressed up as monks rolled into San Francisco’s Haight-Ashbury district in a bus christened the “Yellow Submarine.” Shouting “food as medium,” they doled out political tracts along with scavenged food to fellow freaks hanging out in the Panhandle. The Diggers, as they were called, held regular “feeds” for a couple of years, but they remained on the fringes of the counterculture, which was then caught up in the antiwar effort and the civil rights struggle.

By the end of the ’60s, however, disasters such as the Santa Barbara oil spill and the fire on Cleveland’s Cuyahoga River had trained public attention on the environment. What’s more, news stories on the health hazards of pesti-



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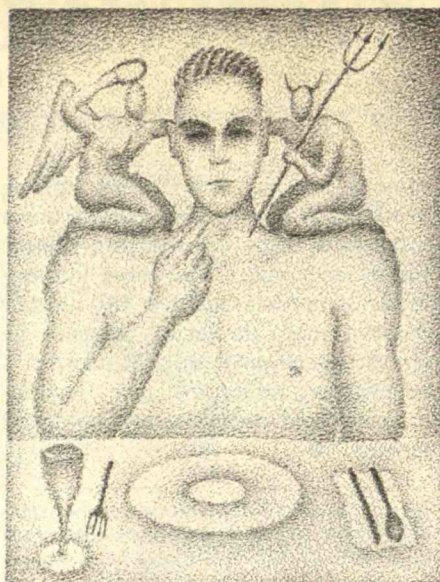
cides and additives such as DDT and cyclamates had given ecological arguments greater resonance. On April 20, 1969, activists in Berkeley claimed an empty lot owned by the University of California, planted seeds, and made speeches urging others to seize land and raise food for "the people." Governor Ronald Reagan, already attuned to the power of political theater, called in the National Guard. By the time the tear gas cleared, the ideals behind "People's Park" had taken root, and ecological issues had acquired a radical cachet.

Warren Belasco, an associate professor of American studies at the University of Maryland Baltimore County, presents a lively narrative of such goings-on in *Appetite for Change*, in which he examines how the counterculture of the late 1960s and early 1970s influenced the mainstream food industry of the 1980s. Although his analysis tends to be rather superficial, Belasco offers an exhaustive and often entertaining account of how "countercuisine" became an integral part of the ecology movement.

A Hard Row to Hoe

By 1970, Belasco writes, many radicals were worried by mounting evidence that certain chemical pesticides and food additives were dangerous, and some even believed that agribusiness firms, medical professionals, and government officials had entered into a grand conspiracy to poison the American people. The underground press reported with alarm that the companies that made DDT also made the defoliants and napalm used in Vietnam. And hip journalists revealed that certain expert apologists for mainstream farming and processing methods received lucrative consulting contracts from food conglomerates. "The logic of this is simple," concluded one underground editorialist. "A drugged, poisoned, sick, mentally deranged populace . . . is easier to manage, to intimidate by police force."

As the 1960s came to a close, "natural food" was big in hip circles, and a skeletal alternative system of about 3,500



communal farms, many linked to urban cooperative groceries, was in the works. At the outset, most co-ops hoped to raise ecological awareness and promote political action while providing healthful food at affordable prices. But demand for organic products outstripped supply, and economies of scale proved elusive. As a result, many co-ops ended up selling high-priced goods to the already converted—mostly middle-class whites who could afford to sacrifice price for principle. As the '70s wore on, the nonprofit co-ops came to look ever more like the companies they had set out to oppose. Although businesses like the Celestial Seasonings herbal tea company continued to eschew pesticides and additives, they increasingly adopted the corporate structures, marketing methods, and financial strategies of the mainstream. In 1984, Celestial Seasonings was sold for a reported \$8–10 million to Dart & Kraft, makers of Velveeta.

As Belasco sees it, disorganization and demographics helped undermine the counterculture's efforts to alter the way America feeds itself. The predominantly young, middle-class reformers were too ambitious to stick with careers as farmers and grocers, and they lacked the patience, determination, and know-how that the task of building alternative institutions demanded. Overconfident and often stoned, they failed to sharply define and effectively defend "organic," "pure," and other key concepts. Eventually, many of these concepts were either challenged or ap-

propriated by mainstream competitors.

One of the counterculture's vaguest ideas, the notion of "natural," was deftly deconstructed and then exploited by defenders of the mainstream food system. The food establishment, which Belasco defines as a "loose alliance of agribusiness firms, government agencies, scientific authorities, and mass media writers," at first defended the status quo with two basic and rather contradictory arguments. Reasoning by tautology, food-industry experts insisted via the popular press that everything—people, pesticides, additives, and apple pie alike—is natural because everything is built from the same set of elements. In Belasco's opinion, this argument is so at odds with common sense that it probably did little to ease public anxieties about food. But he believes that the second argument—that modern food technology is superior to nature—proved more compelling. Evoking the archetypal image of nature as a poor provider, the food establishment's defenders recalled plagues and shortages of times past. They warned in ads, articles, and interviews that hunger and disease await societies that spurn the munificence of modern ways. "Natural farming is perfectly all right," read one ad for an agricultural chemical company, "as long as you believe in natural famine."

Confused, mainstream consumers looked to Washington for information about food safety and the risks and benefits of various additives and pesticides. But the government provided little clarity, says Belasco, and often added to the confusion.

Unfortunately, the same could be said of his own cursory account of what he calls "the mess in Washington." For example, having given full play to the ecofreaks' fears of conspiracy, he does little to dispel or confirm them. He glosses over the "revolving door" issue with a summary of a few officials' professional experience in the food industry and a passing reference to a 1973 *Progressive* piece claiming that 22 of the 52 top people at the FDA had "worked for regulated industries or organizations

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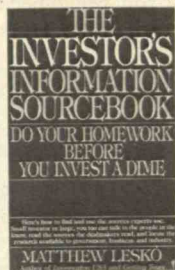
that catered to those industries." In the end, he fails to establish whether the food industry had the FDA under its thumb—and whether anyone really was out to get the paranoid.

Perhaps because Wall Street is a tidier place than Washington ever was, Belasco manages a much more straightforward explanation of why the food industry eventually latched onto some of the countercultural concepts it had tried to discredit. At first, food engineers argued in industry publications that mainstream food companies should resist labeling some foods "natural" or "healthy." Such claims, they said, would suggest that other foods were fake or disease-inducing. Top executives tended to agree.

But in the early 1980s, when marketing surveys determined that a large and affluent minority of Americans was willing to pay more for foods that seemed safer, the old marketing consensus broke down. The industry responded with advertising, packaging, and—as a last resort—new or revamped products that addressed consumer concerns. Some companies added honey or vitamins to sugared cereals, for example, or introduced whole-grain baked goods.

Although Belasco credits the counterculture with popularizing healthful foods and spurring interest in nonchemical agriculture, he concludes that it influenced the mainstream food industry only at the margins. During the Reagan years, when the policing of advertising was lax, indeterminate labels such as "lite" and "pure" proliferated, and the "natural" claim began to appear even on cookies, chips, and other foods generally recognized as junk. In the past year, at least one snack food company has started to give the "all natural" line second billing, below a red-lettered assurance that its corn chips are "real." Once the food debate moves into the realm of ontology, can a return to Twinkies and Coke nihilism be far behind? ■

ANNE MARIE DONAHUE is a free-lance writer living in Cambridge, Mass. She recently edited the anthology *Ethics in Politics and Government*.



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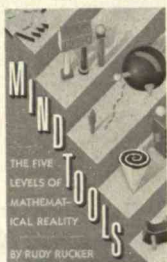
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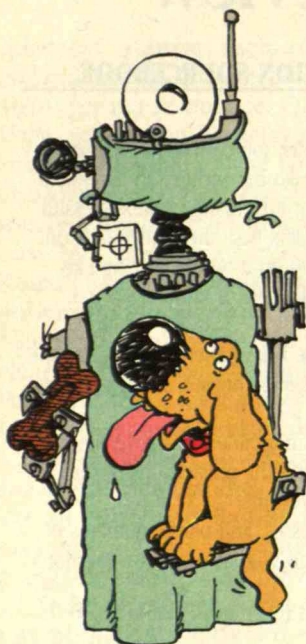
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Notes



Robodoc

Using a robot to achieve superhuman precision, medical researchers from the University of California at Davis have replaced the arthritic hip of a dog with an artificial joint. The operation could lead to robot-assisted hip surgery for people in about a year.

Controlling a small rotary cutting tool, the robot carved out a cavity in the top of the dog's thigh bone to accommodate metal implants. "With the robot, we are able to cut the bone to the dimensions of the prosthesis about 10 times better than we're able to do with hand-held tools," says veterinarian Hap Paul.

A tight fit with the bone should improve the implant's stability, reduce pain after surgery, and speed the attachment of the implant to the bone.

Non-Invasive Fetal Screening

Diana Bianchi, a member of Harvard Medical School's neonatology program, is working

on a fetal screening method that may be virtually risk-free. Because amniocentesis and other current tests to diagnose some genetic traits in a fetus carry a risk, they are usually offered only to women over 35 or to those who have a family history of certain diseases.

Bianchi's test is based on the fact that fetal blood cells cross a placenta to mix with the mother's blood. From a blood sample taken from the mother, Bianchi isolates and tests those fetal blood cells that contain a nucleus and a full complement of chromosomes.

Plastic Bridges

To rehabilitate aging bridges and water mains, Georgia Tech civil engineer Abdul-Hamid Zureick is testing the strength of I-beams made of plastic composites. Roughly a fourth the weight of steel and resistant to corrosion, fiber-reinforced plastic could speed the development of new bridges and water systems.

Who Needs Men?

The female *Trichogramma* wasp doesn't—if she's infected with an as-yet-unnamed microbe. University of Rochester entomologist Richard Stouthamer has discovered a microorganism that eliminates the male in reproduction.

That's good news for the world's farmers, who release hundreds of millions of *Trichogramma* wasps annually to control such pests as European corn borers, cabbage loopers, and diamondback moths. Only the female does the work: by laying her eggs inside those of unwanted insects, she limits their ability to reproduce.

"Wasps with this microorganism produce only females, which is ideal," says Stouthamer.

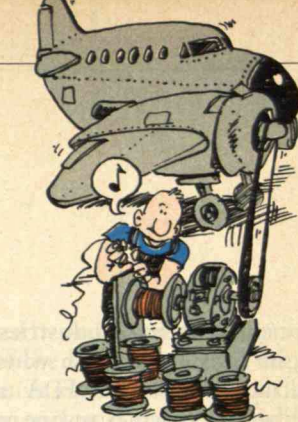
"You don't need to produce these worthless males, which are only good for insemination."

Space Salads

A prototype "salad machine" is growing its first crop at NASA's Ames Research Center. The machine might cultivate leaf lettuce, carrots, sprouts, tomatoes, and other garden-variety plants in outer space.

"Our goal is to produce a variety of fresh salad vegetables for the crews of *Space Station Freedom* and other long-duration missions," notes project manager Mark Kliss. Having a garden—of sorts—might also improve crew morale, he adds.

Tight space means that some plants will be smaller than common earth varieties. Tomato plants, for example, will be under a foot tall.



Recycled Engines

Instead of scrapping airplane engines that can't meet strict noise regulations, two researchers would convert their gas turbines into power plants for industry. Jose Morquillas of the Universidad del Pai Vaco in Spain and Pericles Pilidis of Cranfield Institute of Technology in England say the conversion "can yield good levels of output and efficiency, while also reducing lead time for procurement." The idea could help developing nations in need of cheap ways to upgrade inefficient power equipment.

Speaking at an American Society of Mechanical Engineers meeting in Brussels, Morquillas and Pilidis proposed adapting two-spool bypass engines. These outdated engines are available cheaply enough to reduce the capital costs for power plants by about a third.

Curve Safe

The first study of the cost-effectiveness of road improvements shows that fixing curves would reduce accidents dramatically. In a look at two-lane U.S. highways, Charles Zegeer and his colleagues at the University of North Carolina Highway Safety Research Center found that making curves less sharp, banking them more, and removing obstacles like trees can lower property damage and save lives.

"Accidents at some sharp curves would decline by 80 percent by turning them into milder or flatter curves," Zegeer explains. Some design changes on new roads would add little or nothing to total costs while reducing accidents 5 percent.

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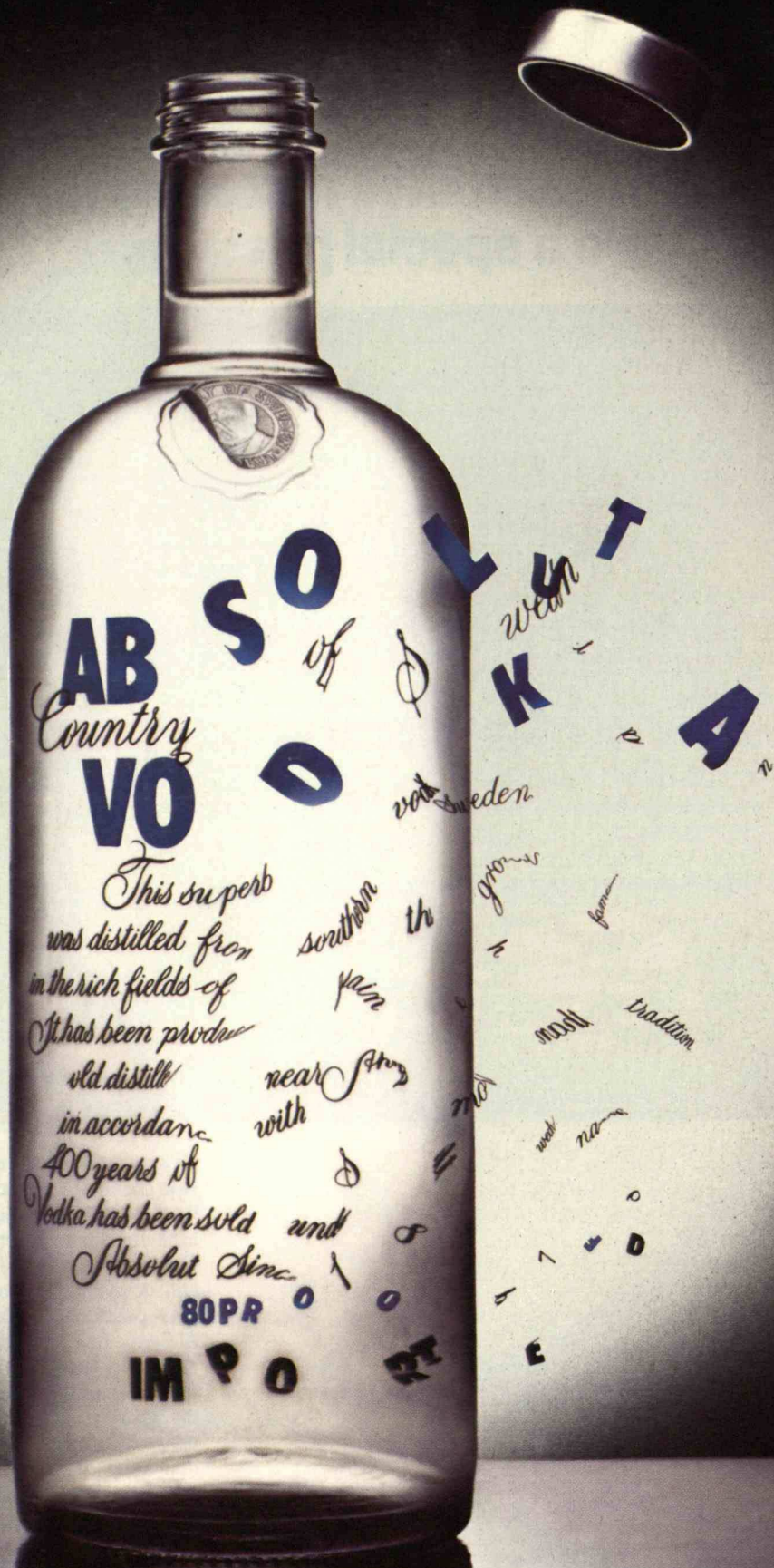
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